

Democritus: Science, The Arts, and the Care of the Soul



EDITED BY

ALDO BRANCACCI & PIERRE-MARIE MOREL

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DEMOCRITUS: SCIENCE,
THE ARTS, AND THE CARE OF
THE SOUL

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INTRODUCTION

A. BRANCACCI AND P.-M. MOREL

This volume gathers the papers presented at an International Colloquium, 'Démocrite. La philosophie, les savoirs, les techniques', organised by the editors under the auspices of the Università di Roma Tor Vergata and Université Paris I Panthéon-Sorbonne, which took place in Paris on 18–20 September, 2003.

In the last twenty-five years Democritus has been the subject of at least two important international conferences, whose proceedings have won an important place in the history of scholarship on Democritean philosophy. One was held in Catania in 1979, which produced the volume *Democrito e l'atomismo antico*, containing some thirty contributions, and another was held in Xanthi in 1983, whose proceedings contain thirty-seven more.¹ When we decided to organize yet another meeting on Democritus we were all too conscious of these two precedents, which weighed heavily on our thoughts not least because of their range, but we took the decision not to follow their example. Instead, we chose to limit ourselves to Democritus himself, excluding the Democritean tradition of the fourth century (Metrodorus of Chios, Anaxarchus, Hecataeus of Abdera, Nausiphanes) and also, with more reason, the larger and more complex tradition of ancient atomism more generally. In doing so, we were simply following the example given by most of the interpretative and polemical traditions of antiquity: even after Epicurus, Democritus appears as a particular and distinctive character in ancient atomism. That is very clearly the case in Plutarch, Sextus Empiricus, Galen, Diogenes Laërtius, and in the majority of the reports in the Aristotelian commentators. We therefore decided to concentrate our attention on relatively neglected areas of research on Democritus and on themes on which it is legitimate to expect new contributions and, finally, new interpretative suggestions. In addition,

¹ *Democrito e l'atomismo antico*, Atti del Convegno Internazionale (Catania 18–21 aprile 1979), *Siculorum Gymnasium* N.S. xxxiii (1980), a cura di F. Romano; *Proceedings of the 1st International Congress on Democritus (Xanthi, 6–9 oct. 1983)*, pref. by L.G. Benakis, 2 vols., Xanthi 1984.

it appeared necessary to grant special importance to the catalogue of works compiled by Diogenes Laërtius and, using that as a starting-point, to fundamental problems of the texts and sources involved in reconstructing Democritus' thought. We have tried to represent the various areas of his philosophy without, however, aiming for an exhaustive coverage which would, in any case, be difficult to realize. In this series of ideas, which opportunely privileges the theme of the arts and of varieties of knowledge, we find the axis on which depend some of the fundamental motifs of his philosophy—the role of empirical observation, the value of reason, the method and principles of science, the overarching interest in inquiry into causes—broadening out into a wide range of problems and areas of research. The variety and complexity of Democritus' intellectual world represents, from a historical point of view, the final rich and mature phase of not only of Ionian philosophy but also of Greek natural philosophy more generally. Democritus is indeed an originator, and a great one (something which has been recognised widely, and with reason, throughout the history of philosophy), but he is also a philosopher tied in many different and subtle ways to the culture and philosophy which preceded and surrounded him, and of which he is also a sharp critic. The range of his interests—scientific, philosophical, literary—has not always been recognised in the course of the history of scholarship, and is therefore a recent emphasis, fully acknowledged by the scholarship of the twentieth century. The present volume, among its other objectives, hopes to draw attention to the most recent advances in research, noting and engaging with recent publications.

In fact, Democritean studies are currently enjoying a new momentum, comparable to that which they experienced at the end of the nineteenth and beginning of the twentieth centuries. In the great nineteenth century treatments of the history of philosophy, Democritus was initially considered exclusively for and, so to speak, in the light of his atomic theory. This is quite evident in Hegel's *Vorlesungen*: Democritus is there combined with Leucippus, considered as 'der Urheber des berühmten atomistischen Systems, das, in neueren Zeiten wiedererweckt, als das Princip vernünftiger Naturforschung gegolten hat' (G.W.F. Hegel, *Vorlesungen über die Geschichte der Philosophie*, in *Sämtliche Werke*, Bd. 17, Stuttgart 1928, 381). Hegel in fact recognises many merits in Leucippus and Democritus, both philosophical and scientific, and stresses their denial of the Eleatic opposition between being and non-being. But the theoretical context in which his discussion of the two atomists appears is entirely ontological, and little else is mentioned.

Eduard Zeller's *Die Philosophie der Griechen* (whose first edition in three volumes appeared in 1844–1852, but which found its final form with the second edition in five volumes of 1859–1868 and then with the final edition presided over by Zeller himself of 1891), sheds full light on Democritus' scientific interests, treating the fundamental aspects of his thought (the theory of atoms and void, cosmogony, epistemology and psychology), and placing atomism in a historical context with both previous (Eleaticism, the Pythagoreans, Empedocles) and contemporary philosophy (Anaxagoras, the Sophists). Interest in Democritus' cosmogony is also found in the *Grundriss der Geschichte der Philosophie von Thales bis auf die Gegenwart* (Berlin 1863–1866) by Friedrich Überweg, which places Democritus in the initial phase of ancient philosophy (*Die vorsophistische Philosophie oder die Vorherrschaft der Kosmologie*), where the primary interest is in objective data, interpreted as the domain of cosmology. But in this context Democritus is not distinguished from other natural philosophers to any significant degree.

A more complex evaluation of Democritus appears not in the Hegelian tradition but, not accidentally, in the neo-Kantian tradition, which is more interested in the development of specific problems within the history of philosophy than the abstract *Entwicklung* of philosophy itself. It is worth noting that a tentative move to reconcile atomism with Kantian criticism was explicitly made by Kurd Lasswitz, author of *Atomistik und Kritizismus*, Braunschweig 1878 (and of *Geschichte der Atomistik vom Mittelalter bis Newton*, 2 vols, Hamburg 1889–1890). Similarly, Wilhelm Windelband, in the *Geschichte der Philosophie* (Freiburg i. B. 1892, 2nd edition: *Lehrbuch der Geschichte der Philosophie*, 1900) and in the *Geschichte der alten Philosophie* (München 1888). He distinguishes, above all, the discussion of Leucippus from that of Democritus, setting the former in the context of *Naturphilosophie* and the latter in that of *griechische Aufklärung*, after the Sophists and Philolaus and before Socrates. Furthermore, he subdivides his discussion of Democritus' thought into two basic areas, the *theoretische* and the *praktische Philosophie*, and sheds light on how, above all, Democritus values a rigorous and coherent form of materialism which repositions the task of science as the reduction of qualitative to quantitative relationships, and thereby inaugurates a new vision of the world.

However, at around the same time as Hegel, the two first editions of Zeller's work and Überweg, come two works which constitute two important steps in Democritean scholarship. In 1860 Friedrich Wilhelm August Mullach published in Paris the first volume of *Fragmenta*

Philosophorum Graecorum, which included Democritus (whose fragments he had already separately published in 1843 with the title *Democriti Abderitae Operum fragmenta*, which followed his *Quaestionum Democritearum Specimen* of 1835). This collection of texts encouraged and rapidly produced a wider awareness of his thought by offering an expansion in the range of evidence and, subsequently, of Democritus' theory, and more precise referencing; truly essential conditions for any progress in research. Further, the first edition of *Geschichte des Materialismus* by Friedrich Albert Lange was published in 1866, followed by various revised editions over the course of the century. It attracted the interest of many scholars and philosophers, among whom were the young Nietzsche and Hermann Cohen.² In this work, which opens with the famous declaration: 'Der Materialismus ist so alt als die Philosophie, aber nicht älter'—where the accent falls on the second half of the sentence (cf. F.A. Lange, *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart*, Leipzig 1898⁶, 3), Democritean atomism is subjected to a detailed analysis and a theoretical re-launch proper to the prestigious authority it lends to the entire subsequent history of materialism. Democritus is credited with having broken natural philosophy out of the vicious spiral into which it has fallen (in so far as it identified the rational principle of the world with some primordial element such as the air of Diogenes of Apollonia, which attributes the ultimate mystery of the world of the senses to the first origin of things), inspecting the essential nature of matter, granting only those simple properties which are necessary for understanding a given fact in space and time, and straining to explain all phenomena in terms of these properties alone. The final product of this line of interpretation is found in the *Grundriss der allgemeinen Geschichte der Philosophie* by Wilhelm Dilthey (1885, with revisions in subsequent editions between 1889 and 1905), and in the *Griechische Denker* by Theodor Gomperz (1896–1909, 2nd ed.: 1922–1931), where Democritus once again takes on a central and innovative role for hav-

² Cohen had sent Lange the first edition of his *Kants Theorie der Erfahrung* (1871) stating that, after reading the first edition of *Geschichte des Materialismus* (1866), he was convinced that Lange was close to Kant. There has been discussion over whether the second edition of Lange's book had been influenced by Cohen in the part on Kant. Cohen then wrote an important *Einleitung mit kritischem Nachtrag* to the 1896 edition (now available in H. Cohen, *Werke*, 5, Hildesheim 1984). For Nietzsche's knowledge of Lange's work, and its influence on his interpretation of Democritus, see P. D'Iorio, in F. Nietzsche, *Les philosophes préplatoniciens*, texte établi à partir des manuscrits, Paris 1994, 27–30.

ing understood qualities to be subjective and having reduced physical reality, the object of natural science, to pure quantity. From this point of view, which has links to contributions made by scholars trained in classical philology but who then became professional scientists (consider the studies, cited widely at this period and still now, by A. Brieger, *Die Urbewegung der Atome und die Weltentstehung bei Leukipp und Demokrit*, Progr. Halle 1884, and above all by H.-K. Liepmann, *Die Mechanik der leucipp-democritischen Atome*, diss. Berlin 1885), Dilthey insists on the fact that Democritus marks, after the Pythagoreans' mathematical conception, the second stage in the determination of natural philosophy, tied to the idea of universal mechanism. Gomperz, on the other hand, reduces Democritus' philosophy to a series of scientific explanatory principles which confer a certain rigid unity to his thought.

In Zeller's work, ethical thought also makes an appearance (though Zeller himself thinks that Democritus is far from offering a scientific, rational and systematic, elaboration of moral matters). However, once again it is the neo-Kantian tradition to which we owe the clear emergence and theoretical investigation of this aspect of Democritus' thought—the last of its three principle aspects to receive attention. In 1893 Paul Natorp published *Die Ethika des Demokritos*, which includes not only an edition and study of the ethical fragments attributed to Democritus (including a linguistic study), but also a reconstruction of the *Grundzüge* of ethics. Natorp attempts to show the coherence of the fundamental principles of epistemology and physics: reason (φρόνησις, λογισμός) rather than the πάθη is the ethical criterion. Windelband too, as we saw, made room for ethics in an interpretative framework which is similar to, if more nuanced than, that of Natorp. Moreover, perhaps in this respect more than any other philological and philosophical research went hand-in-hand; it is sufficient to note the pioneering studies of the ethical fragments by F. Lortzing (*Über die ethischen Fragmente Demokrits*, Berl. Gymn.-Progr. 1873) and R. Hirzel ('Demokrits Schrift Περὶ εὐθυμίας', *Hermes* 14, 1879, 345–407) and that Natorp also discussed Democritean ethics in his piece 'Demokrit-Spuren bei Platon' (*Archiv für Geschichte der Philosophie* 3, 1890, 347–362).³ More exhaustive

³ The nineteenth century also saw a specifically philosophical Democritean revival, represented in particular by Marx who, as is well known, took a doctorate in philosophy with his thesis on the *Differenz der demokritischen und epikureischen Naturphilosophie* (1841), which however has had only a marginal influence on Democritean scholarship. The case of *Die vorplatonischen Philosophen*, written by the young Nietzsche on becoming Professor of classical philology at Basilea (1873), is slightly different. This lecture course has

treatment of Democritus' theoretical and cultural interests was to come in 20th century historiography, and thus is recent. However, secure foundations were already laid at the beginning of the century. Just as the beginning of the century saw the completion of the collection of texts, with the *Fragmente der Vorsokratiker* by Diels, first published in 1903.

After this point, there is a marked downturn in studies devoted to Democritus in comparison with the earlier period, both in numerical terms, and also relative to works devoted to other Presocratic philosophers. Notable exceptions, though, are works by V.E. Alfieri (*Gli Atomisti. Frammenti e testimonianze*, Bari, 1936; *Atomos Idea: l'origine del concetto dell'atomo nel pensiero greco*, Firenze, 1953; 1979²), which propose a new interpretation of the ontological status of the atom and are also driven by a concern to pay attention to and gather together Democritus' diverse philosophical interests. For its part, the edition by Luria (*Democritea*, Leningrad, 1970), helped by enlarging the textual material. Nevertheless, it was necessary to wait until the 1980s before there was a Renaissance comparable to the first 'wave' we have just mentioned. The renewed interest therefore rests on a solid, albeit interrupted, history stretching back to the beginning of the twentieth century. But it also brings with it new suggestions. These are the suggestions which had to be presented, questioned, and further elaborated in taking account of Democritean forms of knowledge.

The characteristic richness of Democritus' theoretical and cultural interests, well represented by the ancient catalogue of his works, suggested the arrangement of the articles in this volume according to the order of that very catalogue. We therefore begin with the contribution by Walter Leszl (*Democritus' Works: from their Titles to their Contents*, pp. 11–76), which offers an analytical study of Thrasyllus' catalogue, its structure and its aims. Leszl examines the Democritean catalogue in comparison with those of other philosophers, concentrating in particular on the work entitled *Confirmations* and on the various spurious works or those of dubious authenticity. He tries to determine the relationship between the titles and the content of the works.

a place in the grand tradition of German philosophers' *Vorlesungen* of philosophical history. These lectures—which are currently receiving more interest—display Nietzsche's characteristic synthesis of philology, learning and philosophical interpretation, although it is fair to say that they have not had much influence on subsequent philosophical historiography.

The next two articles concentrate on ethics and psychology. C.C.W. Taylor (*Democritus and Lucretius on Death and Dying*, pp. 77–86) shows that the differences between the views of Democritus and Lucretius on death and dying arise naturally from their different conceptions of the soul. For Democritus the soul is a simple psycho-physical structure permeating the body, with no central locus of psychic functioning. This allows for the continuation of residual psychic functioning and the resumption of full psychic functioning after apparent death. Lucretius follows Epicurus in identifying a central locus of psychic function (*animus*) which controls the *anima* permeating the body. James Warren (*Democritus on Social and Psychological Harm*, pp. 87–104) examines Democritus' assertions about the correct treatment of criminals and enemies, emphasizing his strict insistence on the pre-emptive removal of possible threats. He notes the concern for preventing certain damaging psychological consequences of crime and suggests a link between this concern and the theory of *eidola* which, it seems, when emitted by a person may retain an imprint of his or her psychological state and transmit it to the perceiver. This may suggest a link between Democritus' physical and ethical theories.

The next two chapters, by Pierre-Marie Morel (*Démocrite et l'objet de la philosophie naturelle. A propos des sens de φύσις chez Démocrite*, pp. 105–123) and Jean Salem (*Perception et connaissance chez Démocrite*, pp. 125–142), concentrate on physics. For Morel, Democritus is without doubt a 'natural philosopher', as is made clear both by the importance of his physical theory in the eyes of his ancient readers and also by the organization of his own corpus. It is nevertheless necessary to clarify precisely what Democritus means by 'nature'. An examination of the occurrences of the term in the fragments and testimonia reveals that it is far from univocal. Nor is there a single governing or encompassing meaning. The Democritean notion of 'nature' is a concept which can be applied just as well to atoms as to perceptible composite bodies, and simultaneously connotes both stability and becoming. In his contribution, Salem studies the Democritean theory of perception and the various questions it raises. He underlines the essential role given by Democritus to perceptible experience, although this risks establishing a 'two-fold approach to reality', in which legitimate knowledge can correct or, if required, overturn the primary information delivered via the senses. He notes, finally, that Democritean mathematics seems to have mistakenly over-valued empiricism. Democritus appears, above all, to have lowered mathematics to the level of a sub-discipline of physics, thereby

limiting the domain of pure mathematics to that of arithmetic. Lorenzo Perilli's contribution (*Democritus, Zoology and the Physicians*, pp. 143–179), completes this area of interest and finds an emphasis on natural philosophy in the ἀσύντακτα. Perilli attempts to establish Democritus' contribution, if any, to a pre-Aristotelian zoology. In proposing a reconstruction of the framework and of the network of connections, he assumes that Democritus does not seem to make significant innovations in zoological investigations, but rather takes up a position on topics which had already been largely discussed, and acts as a point of confluence. Already established notions, traditional knowledge, new discoveries or hypotheses, seem to acquire a new meaning as they are adapted to the atomistic theory.

The next two chapters concentrate, respectively, on the Μουσικά and the Τεχνικά. Aldo Brancacci (*Democritus' Mousika*, pp. 181–205) reconstructs the essential characteristics of Democritus' conception of music and poetic theory: he shows that the latter agrees with the principles of atomistic theory and has not the irrationalist character which has often been attributed to it. This study is preceded by an examination of the structure of the titles of Democritus' works, the most important terms from which they are composed, the interests which these express, and which combine to place Democritus both against the earlier musical-poetic tradition and also against the analogous sophistic inquiries of Democritus' own period. M. Laura Gemelli Marciano (*Le Démocrite technicien. Remarques sur la réception de Démocrite dans la littérature technique*, pp. 207–237) emphasizes the ancient texts which refer to the image of Democritus polymathes, author of technical treatises. According to Gemelli Marciano, the titles of these works and the testimonia for this topic have nevertheless been considered spurious because Democritus is viewed exclusively as a 'philosopher'. Her contribution, by examining the tradition of medical and agricultural works, seeks to question this single-minded interpretation and to propose an alternative basis for the discussion of the authenticity of the relevant Democritean testimonia.

After this group of chapters come two studies devoted to episodes in the afterlife of Democritus: the reception of Democritus in the ancient Academy and in Epicurus (*Démocrite à l'Académie?*, pp. 239–263), discussed by Denis O'Brien, and various references to Democritus by Aristotle, examined by Annick Jaulin (*Démocrite au Lycée: la définition*, pp. 265–275). By way of answer to Aristotle's criticism of Democritus, O'Brien remarks, Epicurus allows that, although they are not physically divisible, the atoms do admit of a conceptual division into parts or 'limits',

each one of which is equal to any other. The sub-elemental triangles of the *Timaeus*, so Aristotle lets it be known, are likewise equal in size. Has Epicurus been influenced by Plato in modifying the original atomic theory so as to have equal elemental particles as the ultimate constituents of the universe? Jaulin argues that the Aristotelian criticism of atomist physics is quite compatible with a positive appreciation of Democritus' methodology. Having noted that certain aspects of Democritus' method receive a positive evaluation by Aristotle, she attempts to show that Aristotle's theory of definition is part of a tradition of theorizing about differences set out by Democritus.

Jaap Mansfeld's contribution (*Out of Touch. Philoponus as Source for Democritus*, pp. 277–292), concludes both this group and the volume. He offers a study of John Philoponus as an important, and still little examined, source. Mansfeld shows that an overview of Philoponus' references to Democritus reveals the insufficiency of his scholarship as well as his indebtedness to earlier attempts at explaining Aristotle. As he tells us both that atoms do and that they do not touch each other, one should not appeal to his evidence in favour of the (modern) view that they do not.

Finally, the editors would like to thank the institutions and people who, in various ways, helped or encouraged the Colloquium from which this volume derives: L'Université de Paris I Panthéon-Sorbonne (Le Conseil scientifique de l'Université; l'EA 2482 'Tradition de la pensée classique'; l'EA 1451 'Centre de recherche sur l'histoire des systèmes de pensée moderne—CHSPM'; L'École Doctorale de l'UFR de philosophie), L'Università di Roma Tor Vergata (il Magnifico Rettore; la Commissione Ricerca Scientifica d'Ateneo; il Dottorato di ricerca in Filosofia) and, on a personal note, Bernard Besnier, Monique Dixsaut, Carlos Lévy, and Francis Wolff. We also thank the editors of *Philosophia Antiqua* for accepting this volume in the series. Thanks are also due to the editorial staff at Brill, particularly Irene van Rossum and Gera van Bedaf, for their friendly assistance. Sincere thanks also to Lorenzo Perilli and James Warren for their efficient help and amicable support, as well as to Francesco Aronadio and Ascanio Ciriaci for their cooperation.

DEMOCRITUS' WORKS: FROM THEIR TITLES TO THEIR CONTENTS

WALTER LESZL

1. *Introduction*

Democritus is the only Presocratic philosopher to whom a rather large number of works are attributed. Most of the Presocratic philosophers are supposed to have written just one work or very few. (Melissus, Parmenides and Anaxagoras are explicitly mentioned by Diogenes Laertius, prooem., I 16, as having written just one work. The same author mentions one title in the case of Heraclitus, cfr. IX 13. In the case of Empedocles there is a scholarly controversy going on as to whether he wrote one or two works, but in any case the possibility of his having written more than two works is generally excluded.) In the case of Democritus, not only are various titles mentioned by a number of sources but we are left with a rather long list of titles of works (70 titles, excluding double titles) which is found in Diogenes Laertius (the greater part of this list, as we shall see, is said by him to go back to Thrasyllus). In stark contrast with these testimonies there is the article *Demokritos* in the *Suda* Lexicon (cf. 68 A 2 DK = 0.2.2 Le.)¹ which contains the assertion that only two works by Democritus are authentic: *The Great World-system* (Μέγας διάκοσμος) and *On the Nature of the World* (Περὶ φύσεως κόσμου). Some of the articles in the *Suda* are, or include, reproductions of passages in Diogenes Laertius, but in this case the source is evidently different,² and is in contrast with the fact that this author, in the pas-

¹ In what follows the references to the *Vorsokratiker* by Diels and Kranz are accompanied by indications, of the type '0.2.2 Le.', as in this example, or without 'Le.', which are to my collection of the texts of the first atomists. The publication of the volume of the texts translated into Italian, optimistically announced for the year 2002 in my contribution to *Qu'est-ce que la Philosophie Présocratique?* édité par A. Laks et C. Louguet, Presses Universitaires du Septentrion, Lille 2002, 142 n. 4, is in fact to take place in the year 2007, in a collection of the Academy 'La Colombaria' published by Olschki of Florence.

² It is supposed that it is, directly or indirectly, a lost work by Hesychius Milesius,

sage referred to above, lists Democritus among the philosophers who wrote many works (he is associated with Zeno, manifestly intending the Stoic, Xenophanes,³ Aristotle, Epicurus and Chrysippus). Not only is the testimony of the *Suda* in contrast with our other main sources but its credibility is also impaired by the fact that its author treats the *Letters* under Democritus' name as being authentic. (The reference must be to the *Letters* which he was supposed to have exchanged with Hippocrates and which have come down to us as part of the *corpus Hippocraticum*. That these documents are a later fabrication is generally recognized by scholars; see on this matter e.g. Rütten (1992).

Friedrich Nietzsche, in his early philological writings, was inclined (not without some uncertainties) to give credit to the testimony of the *Suda*, maintaining that the reference to the *Letters* was a later addition and that the reference to Democritus in Diogenes Laertius' list of *polygraphoi* is a mistake. The reference should be to Demetrius. (These writings by Nietzsche, which belong to his *Nachlass* and are collected in full in the volumes I refer to below, show a very great interest in Democritus and are complementary to his exposition of the position of Leucippus and Democritus in § 15 of his *Vorlesungsmanuskript* entitled *Die vorplatonischen Philosophen*.)⁴ He thought that attributing more than two works to Democritus would go against the attitude of restraint and simplicity that was typical of a Presocratic and was instead in conformity with a practice of 'polygraphy' which started with the Socratics and the scientific practice of the Peripatetics.⁵ Yet Democritus' polygraphy

who lived in the sixth century, but of course nothing is known of the sources of this author.

³ Perhaps an error for Xenokrates, as suggested by Ritschl and Nietzsche.

⁴ This is available in the partial edition of the manuscript included in *Die Philosophie im tragischen Zeitalter der Griechen*, edited by M. Riedel, Stuttgart 1994, and in the following French translation by N. Ferrand, with introd. and notes by P. D'Iorio and F. Fronterotta: *Les philosophes préplatoniciens*, Paris 1994.

⁵ Nietzsche, *Nachgelassene Aufzeichnungen Herbst 1864—Frühjahr 1868*, herausgegeben von J. Figl, bearbeitet von I.W. Rath, Abt. I, Bd. 4 der *Kritischen Gesamtausgabe*, Berlin 1999, 283ff. [Mp VIII 6]. The last remark comes from p. 303: 'Es giebt unter ihnen keinen, der mehr Schriften verfasst habe, ja die allermeisten haben ihre Weisheit in ein Buch zusammengefasst. Der entgegengesetzte Glaube hat sogar etwas Anstössiges. Man sieht nicht ein, warum plötzlich ein Philosoph von jener Sitte der Zurückhaltung und Einfachheit abgesprungen sein sollte. ...' (It should be noticed that this collection of writings includes, as relevant for Democritus, the copy-books P I 4, P I 6 and P I 7, and that the last two are available in French translation under the title *Écrits de jeunesse* in Nietzsche's *Œuvres I, La Naissance de la tragédie—Considérations inactuelles*, Paris 2000. In what follows I shall make reference to this edition.)

should be related to a polymathy which is not only attributed to him by Thrasyllus (in the passage quoted below) but comes out also from the (apparently unprejudiced) assertion by Philodemus that he was 'not only the most scientific (*physiologotatos*) of the ancients but also the most industrious⁶ of all of those we have heard of'.⁷

On the whole the impression that one gets, in surveying the testimonies and the fragments that we have of Democritus, is that his interests were encyclopaedic and that he covered almost every field of knowledge of his own time. There is an assertion to this effect attributed to Democritus himself in more than one source and which must have constituted the beginning of a work of his (perhaps of *The Little World-system*): 'these things are said by Democritus about the totality of things (Περὶ τῶν ξυμπάντων)'. (The Greek in this formula is ambiguous, and may mean 'about the universe', but this ambiguity could be intentional.) The testimony of Diogenes Laertius is of relevance as well, when he quotes (more or less literally) the following assertion by Thrasyllus: 'Since the *Anterastae* are by Plato,⁸ he [*scil.* Democritus] will be the unnamed character, different from Oenopides and Anaxagoras and their followers, who makes his appearance when conversation is going on with Socrates about philosophy, and to whom he [*scil.* Socrates] says that the philosopher is like the pentathlon athlete [cf. *Anterastae*, 135a–c]. And he was indeed a pentathlon athlete with regard to philosophy, for he had trained himself both in physics and in ethics, even in mathematics and the field of general education, and was quite an expert in the arts.' (Diogenes Laertius IX 37 = 68 A 1 DK = 0.2.1 Le.; the final passage coincides with the article 'pentathlon athlete' in the *Suda*, cf. 0.2.1.1.).

One should bear in mind that Democritus was (more or less) a contemporary of Socrates and Hippocrates, thus not a Presocratic from a chronological point of view. He could not have remained indifferent to a cultural phenomenon of the second half of the fifth century, namely the great increase in works of erudition (what Christian Meier called the *Hochflut von Lehrbüchern*) in fields such as history, medicine (at least some of the Hippocratic treatises were written in this period) and the

⁶ Or the one with the greatest variety of interests: πολυπράγμων.

⁷ 'Of all researchers', according to an alternative translation (cf. B 144 = 127.2).

⁸ It would seem that Thrasyllus himself, as pointed out by Mansfeld (1994) 66 n. 115, and 100 n. 161, had no reservations about the authenticity of the *Anterastae*, since he includes this title in his catalogue of Plato's genuine works, so that εἴτερ must be translated with a 'since' or 'because', not with an 'if', as translators usually do.

other arts. This certainly means a changed attitude to knowledge. Most of the Presocratics wrote to transmit their *wisdom* (Nietzsche himself, in the passage quoted above, talked of *Weisheit* in this connection) and wisdom, in so far as it can be transmitted at all, is not in need of long explanations: either the reader (or hearer) has the right attitude to it and is able to grasp what is being told or any further comments would be as useless as the main exposition. Democritus did not use this restraint, for he manifestly wanted to give instruction and transmit information in the most obvious sense and not just initiate to wisdom.

The testimony of the *Suda* should however constitute a warning: we can be confident that Democritus wrote more than the two works there reported, but we cannot be equally confident that all the works that are ascribed to him are really his. That assertion about there being only two works could not have been made with any plausibility if there was widespread knowledge in late antiquity (i.e. at the time in which the author of that notice lived) of various works by Democritus beyond them. Furthermore, the authenticity of certain works which circulated under his name had already been questioned previously, as is shown by the remark by Diogenes Laertius, at the end of the list he gives of Democritus' works, that certain writings 'were admittedly not his (ἁλλότριά)' (cf. IX 49 = 68 A 33 = 0.6.1), and by other such testimonies to be considered below. There are a few titles that circulated under Democritus' name of which we can be confident they are spurious. None of these coincides with the main part of the list of works of Democritus given by Diogenes Laertius, i.e. with the part that declaredly goes back to Thrasyllus. Should we on this ground be confident (as most scholars seem to be) that the catalogue by Thrasyllus is a faithful mirror of Democritus' production?

What conclusion we draw on this point depends of course on the idea one has of Thrasyllus' way of working. Now, from the little we know of Thrasyllus in an independent way, especially his activity as an astrologer in Tiberius' court, it is difficult to regard him as a person who had the best credentials as a scholar. (This of course is true if, as seems plausible and as scholars usually admit, the Thrasyllus mentioned by Diogenes Laertius and Porphyry and the Thrasyllus mentioned by authors like Tacitus are one and the same person.)⁹ One

⁹ The evidence concerning him is collected by Tarrant (1993) 215ff., as an appendix. The testimony which most favours the view that the two are the same person is a scholium to Juvenal, cf. T1a in his collection.

can suspect that he had not only no great familiarity with techniques for distinguishing what is genuine from what is not so but that he was not even very interested in making this sort of distinction. His parallel enterprise of ordering Plato's works cannot be regarded as a guarantee of his scholarly approach, for it is based on work done previously by real philologists like Aristophanes of Byzantium. (Thrasylus' main contribution consists probably in the ordering of the works in tetralogies. Tarrant, 1993, supposes it is much more important, but one can be sceptical about his hypotheses.) Further, Plato's works must have been rather widely accessible, so that there was little room for 'creative' innovations. And one of the reasons that Thrasylus must have had for intervening in the list of books of Democritus, namely to make him look like a Pythagorean, was not applicable to the list of Platonic works, for there was no need to demonstrate what was widely admitted in those days, that is to say, that Plato's philosophy drew its origin from that of Pythagoras.

Certainly, if the same could be shown for the catalogue of Democritus' works, so far as its origin and as the ready availability of the works go, there would be reasons to put one's trust in Thrasylus' achievement. But, as I shall point out below, the situation in this case does not seem to be the same. One even gets the impression that Thrasylus had no great familiarity with the works themselves for which he gives the titles. (Of course this impression, to be justified below, remains a suspicion, because of the very great limits of our documentation.)

If this is right, the conclusion to be drawn is probably that Thrasylus' catalogue is neither a faithful mirror of Democritus' production nor, on the other hand, a wholly unreliable document. He had his motivations for offering a catalogue of Democritus' works which influenced the result, but these motivations are not such as to lead him to wholly subvert the data on which he relied. What these data themselves were remains, however, an open question, but it cannot be doubted that he made some effort to collect them in order to compile this catalogue and his *Introduction to the Reading of the Books of Democritus*, a work to which the catalogue must have belonged. Furthermore, if he had had a bad reputation as a source of information Diogenes Laertius probably would not have made use of him. It is possible, on the other hand, that the latter had not much choice if he wanted to offer sufficiently detailed information about Democritus. (His sympathy for the philosophy of the atomists is evident from the attention he devotes to Epicurus in book X;

that his life of Democritus was written with care was already pointed out by Nietzsche.)

One can conclude that Nietzsche was too inclined to follow the trend prevailing in the philological studies of the nineteenth century, which tended to question the reliability of our tradition and especially the authenticity of quite a number of works which have come down to us or about which we have some information. (His appreciation of the work of Valentin Rose is evident in the collection of his writings I referred to above.) In the last century there was a reaction to this trend which was justified but which probably went too far in the opposite direction of trying to save even what cannot plausibly be saved. In this new century we should try to find a happy medium between these extremes, always bearing in mind the fact that the exercise of suspicion in this field is salutary.

2. *The catalogue of Thrasyllus: organization and purposes*

The variety of interests shown by Democritus is reflected in the catalogue of his works, which is preserved by Diogenes Laertius (cf. IX 45–49 = A 33 = 0.6.1) and which, as he reports, goes back to Thrasyllus. It is reasonable to assume (as scholars usually do) that the catalogue belongs to a work of Thrasyllus which is quoted as well, though in another connection, by Diogenes Laertius, namely his *Introduction to the Reading of the Books of Democritus* (or, more literally, *What Comes Before the Reading of the Books of Democritus*) (cf. IX 41). This author, in introducing the catalogue, makes the remark that Thrasyllus ordered the books by Democritus in ‘tetralogies’, in the same way as he did with Plato’s works. Thus there is a parallel between this enterprise and the compilation of the catalogue of the books by Plato (reproduced by Diogenes Laertius in III 57–61), which probably was included in a similar *Introduction to the Reading of the Books of Plato* (Diogenes Laertius in III 1 declaredly uses Thrasyllus as a source for his ‘Life of Plato’, so it is likely that there was a similar ‘Life of Plato’ by Thrasyllus and that this belonged to that work, as a ‘Life of Democritus’ must have belonged to that *Introduction to the Reading of the Books of Democritus* which is declaredly a source of information for biographical data about Democritus).¹⁰

¹⁰ This hypothesis is adopted by various scholars, including Mansfeld (1994) 59–61, and Tarrant (1993) 18–20 and 85ff.

The fact that the list of books by Democritus in Thrasyllus' catalogues reflects an order in 'tetralogies' is sufficiently evident, just as it is evident that the books which do not fit this order are kept apart and either said not to be ordered (to be *asyntakta*) in the case of the list given in §47, or said to be ordered separately by some people (τάττουσι δέ τινες ...) in the case of the list given in §49. The inclusion of a list of books said not to be ordered, which, it is to be presumed, also belongs to Thrasyllus, is a point of difference. Another point of difference concerns the overall organisation of the catalogue, for the books by Democritus are grouped under five main headings, while the grouping of the books by Plato is more complex (with four subheadings under two main headings, and a further division in two groups under each subheading) and conforms to a diairetic scheme.¹¹ The way in which the books by Plato are grouped is clearly suggested, at least to a large extent, by the purpose and character which each of them is supposed to have (e.g. some are classified as maieutic, others as peirastic, and so forth). The way in which the books by Democritus are grouped is more definitely suggested by the field of inquiry or discipline to which they contribute, thus corresponding to a grouping that is adopted for some of the dialogues by Plato (physical, logical, ethical, political). But why is there a division into five groups, under the following titles: Ethical books, physical books, mathematical books, 'musical' books and 'technical' books?

There is the suggestion, already made by Nietzsche and adopted by Mansfeld (1994), pp. 100–101, without reference to the former, that this division into five corresponds to the five fields of inquiry which are mentioned by Thrasyllus in presenting Democritus (in the passage quoted above) as a pentathlon athlete of philosophy, the correspondence being in fact clear in the case of four of the five headings: physics, ethics (the inversion in their order is easy), mathematics, the arts. The correspondence is not perfect in the case of the fourth heading (in both expositions), since the 'encyclical discourses' must coincide in scope with the *enkyklios paideia* (hence my translation above: 'field of general education') and this is something more comprehensive than the field of 'music' as mentioned in the catalogue. It certainly was usually supposed to include rhetoric and dialectic, which are not in any way represented in the titles of the catalogue, and also the philosophical and mathematical disciplines, which are represented by titles which are col-

¹¹ An illustration of this is given by Mansfeld (1994) 75.

located under different headings (those of physics and of mathematics). The denomination adopted in the catalogue: 'musical books', is certainly more appropriate, if one takes into account the wide sense which *mousiké* had for the Greeks (this is noticeable for instance in Plato, who in passages like *Laws* II, 654E, regarded figure [σχῆμα], tune [μέλος], song [ᾠδή] and dance [ῥοχαίσεις] as constitutive of music). 'Music' thus understood includes, in addition to music in the narrow sense, poetry, which is manifestly represented by some of the titles given in this section of the catalogue. (The titles: *On Poetry*, *On the Beauty of Verses*, and, at least in part, that *On Homer*, represent poetry, while the titles *On Rhythms and Harmony*, *On Song*, and probably that *On Euphonious and Dysphonious Letters*, represent music.) It is possible, on the other hand, that two of the titles listed in the catalogue, namely *On Words* (or *On Verbs*) and *Onomastic*, and perhaps at least in part the work *On Homer* (for this bears the alternative title *On Correct Diction and Glosses*), have to do with grammar (at least taken in a wide sense), and grammar was not part of the field of 'music', while belonging (at least as a preliminary) to the field of general education. Now this may be a reason why Thrasyllus did not stick to 'music' as the denomination of this field, but was also induced to adopt a more comprehensive title. Another reason for talking of 'general education' may be that he had in mind not simply the contents but also the purpose of these works (we noticed that he takes this into account in classifying Plato's works), which he regarded (rightly or wrongly, we cannot tell) as meant to provide instruments for a general education. It is thus possible to give an explanation of this discrepancy without supposing that the correspondence between the fourth group of books in the catalogue and the fourth field of inquiry in the pentathlon passage is lessened.

Before going on, it has to be pointed out that there is some similarity between the catalogue of the books by Democritus and the catalogue of the books by Heraclides Ponticus to be found in Diogenes Laertius V 86–88.¹² In this other catalogue in fact the books are grouped under the following headings: (1) ethical, (2) physical, (3) grammatical, (4) 'musical', (5) rhetorical, (6) historical. The similarity is indeed evident, but there is also the significant discrepancy that the subdivision is not into five and that no tetralogical order is adopted. We know nothing of the relative dates of the two catalogues, so that it can-

¹² This was already pointed out by Nietzsche, *Nachgelassene Aufzeichnungen*, cit., 456f.; see also Mansfeld (1994) 101 n. 165.

not be excluded in principle that the catalogue of Democritus' works served as a model for that of the works of Heraclides Ponticus rather than viceversa. However a further coincidence (to be discussed below, sect. 3) in some of the titles is probably explained by admitting a priority of the catalogue of Heraclides over that of Democritus (at least in the version by Thrasyllus). Even in this case it is significant that Thrasyllus was induced to adopt some strict numerological criteria, by adopting the subdivision into five groups and the tetralogical order. Perhaps the subdivision into five groups was already adopted by the author of the list on which Thrasyllus depended (for this hypothesis see again sect. 3), but he accepted it because of its conformity with his own view about the nature of Democritus' activity. These numerological considerations must have induced him to leave out nine titles which could easily have been regarded as physical, though also the titles given (which start with 'causes', with the exception of the last title) tend to separate them from the rest. At least there is some likelihood that the catalogue of Democritus' works is related in some way to the catalogue of Plato's works. The total of thirteen tetralogies is obtained by adding nine (the number of the Platonic tetralogies) and four (as a number standing for tetralogy).¹³ Also concerning the total number of books thus listed, it could be significant that it coincides with the total number of books that, according to Thrasyllus' statement, were written by Plato. (This total for Democritus is obtained as follows: $13 \times 4 = 52$, to which are to be added the second book of *On flesh*, the second and the third book of the *Canon*, and the second book of *On Irrational Lines and Solids*, for a total of 56. That Plato's books also numbered 56 is stated by Thrasyllus, in Diogenes Laertius III 57, where it is said the number is obtained by dividing the *Republic* into ten books and the *Laws* into twelve; there are only nine tetralogies, as also stated there, because in this order the two works mentioned count as just one book.)¹⁴

This way of organizing the material is manifestly artificial, and, as we shall see later, requires, among other things, putting some titles under headings that are not wholly fitting. If the hypothesis now considered is right, Thrasyllus would have been obliged not only to leave out

¹³ This suggestion is made by Tarrant (1993) 84.

¹⁴ This coincidence was pointed out by Nietzsche, cf. *Philologische Schriften* (1867–1873), Bd. 1, Abt. II der *Kritischen Gesamtausgabe*, bearbeitet von Fritz Bornmann und Mario Carpitella, Berlin 1982, 229.

those nine titles but also to omit the indication of the number of books (i.e. of the existence of more than one book) in the case of some titles, since their being in the genitive case (in the list he gives) makes one expect that they be accompanied by this sort of indication (this applies for instance to II.4: *Of ethical commentaries* [books?]) and to VI.4: *Of problems* [books?]). Its omission would be the result not of an oversight by some copyist (as usually assumed) but of Thrasyllus' wish to make the number of books by Democritus coincide with the number of books by Plato. However this would imply not only that he was manipulating an existing catalogue, which of course is possible, but that his manipulation was very inept, since he did not take care to change the genitive of some titles into a nominative. Can we ascribe so great an ineptitude to him? (This point seems to have escaped Nietzsche's attention. It can be added that it is not certain from the text we have that there was a second book *On flesh* rather than this work constituting the second book of *On nature*.) One would also have to assume that he kept the coincidence in number between the books of Plato and those of Democritus hidden, possibly because he expected intelligent readers to notice it by themselves.

The grouping of all the titles reported in Thrasyllus' catalogue under five main headings apparently requires taking rather seriously the motif of the pentathlon athlete which is introduced in the Pseudoplatonic *Anterastae*, when in fact in the dialogue it only served to point out, polemically, that one who has an interest in such a large variety of fields (how many they are exactly is not important) cannot reach excellence in any of them, just as the pentathlon athlete is inferior to the specialist in running and so forth.¹⁵ Probably, however, even for Thrasyllus himself fixing on the number five was less important than stressing the *polymathia* which Democritus' works reflect already in their titles. What the author of the *Anterastae*, faithful in this to Plato's own attitude to the matter, judges in a negative way, Thrasyllus must have treated as a positive quality, for this sort of appreciation is involved in the admiration he appears to show for Democritus from this point of view. (The freedom with which he exploits the dialogue is evident already in the

¹⁵ Nietzsche, in *Nachgelassene Aufzeichnungen*, cit., 484 (= *Écrits de jeunesse*, Cahier P I 7, 794), talks of that presentation of Democritus as the *Einfall* on which his division of the Democritean literature is based, adding the following comment about Thrasyllus: 'er benutzt in durchaus unphilologischer Weise einen gelegentlichen Witz, ein geistreiches Bild, um aus solchem Holze die abgrenzenden Kategorien zu schnitzen die das Grundgebälk seiner neuen *pinakes* bilden sollen'.

summary he gives of it, for e.g. Anaxagoras and Oenopides are not personages in the dialogue but are referred to by the young men who, in their discussion, are overheard by Socrates on his arrival. Thrasyllus may have supposed that their mention in the dialogue has something to do with Democritus, since the Abderite is said to have argued against Anaxagoras and to have mentioned Oenopides in his writings, cf. Diogenes Laertius IX 34–35 and 41.) Not only must he have treated it as a positive quality, but he must also have regarded it as a quality which Democritus had in common with Pythagoras. The quality of *polymathia* is already associated with the figure of Pythagoras by Heraclitus, who also regarded it as a negative quality (cf. Diogenes Laertius IX 1 and VIII 6 [= 22 B 40 and 129 DK]). It would seem that this quality, of course not always seen in a negative way, remained associated with his figure up to late antiquity. Thus Lucian, in his *Vitarum auctio* 2, presents Pythagoras as an expert in a variety of disciplines: arithmetic, astronomy, practice of marvels (τερατεία, or perhaps θεραπεία, a correction suggested by Nietzsche, to avoid an overlapping with witchcraft), geometry, music, witchcraft (γοητεία). It was thus easy for Thrasyllus to regard Democritus as a continuator of Pythagoras because of his *polymathia*.¹⁶

Thrasyllus' intent to make Democritus look like a continuator of Pythagoras is also evident from the fact that he put the work entitled *Pythagoras* at the head of the whole list of his works (a fact that is significant quite apart from the doubts that can be held about the authenticity of this work). The inclusion in the third place of the title *On the things in Hades* (or *On those in Hades?*) may not be accidental either, for its contents (suggested by Proclus' remark that in it Democritus spoke of 'those who are believed to die and then live again', cf. 68 B 1 [= 109.3]) could be taken as illustrating Pythagorean teaching. The place occupied in the catalogue by a whole series of mathematical and 'musical' works could also be taken as evidence of Democritus' Pythagorean leanings. Finally, in the case of Democritus' books, the adoption of a tetralogical order in their list cannot be given the justification that is given in the case of Plato's books, namely conformity with the organisation of dramas in tetralogies (cf. Diogenes Laertius III 56), for, unlike Plato's dialogues, they cannot be regarded as a sort of drama. One can suspect that this too was an expedient to make evident the alleged

¹⁶ This suggestion too was made by Nietzsche in his *Nachgelassene Aufzeichnungen*, cit., 486 (= *Écrits*, 796).

Pythagoreanism of Democritus, presumably through some numerological speculation having to do with the Pythagorean tetractys.¹⁷

The fact that Thrasyllus regarded Democritus as a Pythagorean is sufficiently clear from the testimony of Diogenes Laertius: 'He would seem, says Thrasyllus, to have been a follower of the Pythagoreans. Moreover, he recalls Pythagoras himself, showing admiration for him in a work of his own which had (as its title) this very name. He seems to have taken everything (i.e. all his views) from him and, if chronology did not constitute an obstacle, he would certainly have been his pupil.' (IX 38) One can suspect that Thrasyllus was not content with cultivating this view of Democritus but did his best to help in creating it and publicise it. One can equally suspect that it is in this way that he could reconcile his interest in Plato with his interest in Democritus. Already in antiquity there was the widespread conviction that their philosophical positions were opposed and that Plato had an antagonistic attitude towards Democritus (cf. Diogenes Laertius III 25 and IX 40). Thrasyllus must have thought, to his own satisfaction, to have been able to show that all this was ungrounded, for both Plato and Democritus were continuators of Pythagoras. (The testimony of Porphyry in his *Vita Plotini*, §§20 and 21, confirms that Thrasyllus' philosophical leanings were for Pythagoras and Plato.)

One need not exclude any relationship between Democritus and the Pythagoreans. Diogenes Laertius, in the chapter on Democritus, quotes Glaucus of Rhegium (adding that he was a contemporary of Democritus) as having said that 'he heard' (or was the pupil) of some Pythagorean, and Apollodorus of Cyzicus as having said that he frequented Philolaos. The first testimony is very vague and from the only other mention of Glaucus by Diogenes Laertius in his whole work, i.e. in VIII 52 (belonging to the chapter on Empedocles), one gets the impression that he knew something of him only in an indirect way, through the *Chronology* written by the grammarian Apollodorus. The latter is a well-known figure who came from Athens and must be different from the other, little-known, Apollodorus,¹⁸ but one cannot wholly exclude some confusion in Diogenes Laertius. Further, one can suspect that Glaucus, coming from a town which was exposed to Pythagorean

¹⁷ A suggestion to this effect was already made by Nietzsche, *Nachgelassene Aufzeichnungen*, cit., 480. (On the importance of the tetractys for the Pythagoreans see Burkert (1972) 186–188 and *passim*.)

¹⁸ Apollodorus of Cyzicus was regarded as a follower of Democritus, cf. 74 DK.

influence, would not have resisted the temptation of making some well-known philosophers appear as the pupils of the Pythagoreans, even if he could not rely on any substantial evidence to this effect.¹⁹ In any case, the second piece of information could have some basis, for it would not be surprising if Democritus showed an interest in the work of Philolaos, without this having to mean that he adhered to Pythagoreanism. A further testimony of this type comes from Porphyry, *Life of Pythagoras*, §3 (= 14 A 6 DK = 0.8.7), who quotes Duris of Samos as having said that a son of Pythagoras, Arimnestus, was the teacher of Democritus. This perhaps converges with the declaration by Glaucus and does not seem likely already for chronological reasons. A rather similar testimony, given by Jamblichus, *Pythagorean life* 23, 103 (= 67 A 5 = 0.1.3), includes Leucippus among the direct pupils of Pythagoras, and this also seems unlikely for chronological reasons.

The prevailing tradition in doxography puts both Leucippus and Democritus in relationship with the Eleatics, not with the Pythagoreans (this is noticeable even in the succession of thinkers resulting from the exposition of Diogenes Laertius in book IX of his work). And it has to be pointed out that Democritus is never treated as a Pythagorean in the works of Porphyry and Jamblichus. Thus his name is not included in the very large list of Pythagoreans (218 men and 17 women! Parmenides and Empedocles are included) which is given by Jamblichus at the end of his work (cf. *Pythagorean life* 36, 267). (Even Leucippus is not mentioned, which shows some inconsistency.)

3. *The catalogue of Thrasyllus: its origin and its relationship with some other catalogues*

Concerning Thrasyllus' own sources of information, it is often suggested that he depended, for his compilation of the catalogue of Democritus' works, on the catalogue or 'table' (*pinax*) of his works that, according to the testimony of the *Suda*, in the article on Callimachus, was compiled by this scholar and poet.²⁰ In suggesting this modern

¹⁹ This suspicion was also expressed by Nietzsche, *Nachgelassene Aufzeichnungen*, cit., 332–334 (from Mp VIII 6, not translated in French), where he also expresses a reservation about the reliability of another information attributed to him in Plutarch's *De musica*, but this point is not clear to me.

²⁰ This is admitted for example by Diels, *Fragmente der Vorsokratiker*, Berlin 1952, 6th ed., vol. II, 90, apparatus, followed, for example, by Mansfeld (1994) 100–101.

scholars are influenced, I suspect, by the preoccupation to make an enterprise respectable that was conducted by an astrologer in Tiberius' court, that is to say a personage who cannot be said to possess the best credentials as a scholar. Yet, even if it were true that Thrasyllus depended on Callimachus' work, there is no guarantee at all that he followed him faithfully, rather than introducing changes meant to show that Democritus was a Pythagorean.²¹ However this testimony on Callimachus (for which cf. A 32 = 0.9.8) is not without difficulties, as I shall illustrate in what follows, though I cannot discuss them in detail.

If, in the statement that Callimachus prepared a 'table' (*pinax*) of *glossai* and *syntagmata* of Democritus, we take *syntagmata* ('compositions') as equivalent to *syngrammata*, that is to say, in the sense of books or works, what is surprising is that one and the same list should cover items as different as the titles of books and *glossai*, that is to say (presumably) 'rare' or 'idiomatic words'. It is also surprising, as pointed out by Pfeiffer (1968), p. 132, that a separate list should have been given of Democritus' books with respect to the main collection of lists, in 120 books, of 'those who distinguished themselves in every field of culture (*paideia*) and of what they wrote' (this is mentioned in the *Suda* and referred to in Tzetzes).²² An interest in *glossai* in Democritus on Callimachus' part is not in itself surprising (as was pointed out by Denis O'Brien, 'Démocrite d'Abdère', *Dictionnaire des Philosophes Antiques* II, pp. 699ff., in defending this interpretation of the passage), but, if we suppose, as he does and as seems natural enough, that Callimachus did not simply list words used by Democritus that are rare or peculiar, but gave some explanation or definition of their meaning, there is the additional difficulty that a 'glossary' would be called simply *Glossai* and not *Pinax glossôn*.²³ If Callimachus was the compiler of a catalogue of Democritus' writings, why did Diogenes Laertius not use him as his source rather than the work of a person of dubious reputation? Diogenes must have been familiar with Callimachus' main collection, for he makes two references to it, one explicit (cf. VIII 86) and one implicit (cf. IX 23). It is true that he does not rely on Callimachus even for the other catalogues he gives, but probably because he wanted to offer more recent information. And, in

²¹ Diels maintained that the tetralogical ordering of Democritus' works goes back to Alexandria, but there is no basis for this, as already pointed out by Mansfeld (1994) 101.

²² Cf. discussion in Pfeiffer (1968) 127–131.

²³ This is the name given to the glossaries of Simias, Philitas and Zenodotus (cf. Pfeiffer, 1968, 89–90 and 115), as pointed out by West (1969), 142.

our case, it can no doubt be claimed that this particular catalogue was no longer available to him. A complication is that one gets the impression that Diogenes Laertius was familiar with some other catalogue or catalogues (this is shown by the way he introduces the catalogue: 'his books were listed also (καί) by Thrasyllus ...',²⁴ and perhaps also by his assertion towards the end that 'some order separately the following works from the *Commentaries*'), only that this (or these) must have been regarded by him as inferior to that of Thrasyllus. The possibility that only Callimachus' catalogue was lost, though of course it cannot be excluded, is not very likely.

Coming back to the testimony concerning Callimachus, *syntagma* could also indicate an element in a syntactical construct or even the construct itself, so that one could understand that expression, as Fraser (1972), p. 455, does, as meaning: 'List of rare words and constructions in Democritus'. This suggestion is open to the objections that this meaning of the word is rare and that it is not easy to imagine a list of such syntactical constructs (as remarked also by O'Brien, 1994, p. 700). Faced with these difficulties, some scholars were induced to correct the text, but none of the suggested corrections is quite satisfactory, and, in any case, we go further away from the view that Callimachus prepared a list of Democritean books. A further difficulty is raised by the fact that a correction is needed in any case (the MSS of the *Suda* have *Demokrates*, not *Demokritos*, though this is not evident from Diels' text and apparatus). We have to conclude that this testimony about Callimachus is of no help.

It is still possible to attempt an explanation as to how Thrasyllus collected his information, that is that he depended on some previous work of cataloguing, although by whom it is difficult to say (Callimachus remains a possibility ...). The starting-point is an observation made initially by Nietzsche. He pointed out that there is a coincidence between some of the titles in the catalogue of Democritus and some of the titles in the catalogue of Heraclides Ponticus.²⁵ In the latter catalogue we find the following list of titles of works belonging to the group of physical works: '(1) *On Intellect*, (2) *On the Soul* and, separately, (2a) *On the Soul* and (3) *On Nature* and (4) *On Images*, (5) *Against Democritus* (or *On Democritus*?),²⁶

²⁴ The καί is usually ignored in translations.

²⁵ Cf. *Nachgelassene Aufzeichnungen*, cit., 212 and 219 (from P I 4, not translated into French).

²⁶ The text as it stands has to be corrected.

(6) *On celestial things*, one book, (7) *On the Things in Hades* (Diogenes Laertius V 87 [= fr. 22 Wehrli] = A 34 = o.9.3). Of these titles (leaving out the repetition of the title *On the Soul*, hard to explain) the following coincide with those in the catalogue of Democritus: (1) = [IV.3] *On Intellect*, (2) = [IV.4] *On the Soul* (as the comprehensive title suggested by 'some'), (3) = [IV.1] *On Nature*, (4) = [VI.2] *On Images*, (7) = [I.3] *On the Things in Hades*. It must also be significant that a title concerning Democritus is included in the list. Diels quotes the series from (2a) to (5) and evidently takes it as one work written against Democritus. This has the advantage of explaining the second quotation of *On the Soul* (introduced by 'separately'), but goes against the objections that the successive titles in the list, of which (7) has something to do with Democritus, have to be dropped, and that it is surprising that one work should receive such a (non homogeneous) variety of titles (at most one could accept the association of (4) with (5)). (Notice that in the same catalogue the only work on rhetoric is mentioned as follows: '*On Oratory* or *Protagoras*', which is quite a satisfactory combination). Nietzsche, while regarding them as titles of distinct works, seems to suppose they were all written against Democritus, but this is excessive (there is no trace of such an extended dispute with him by Heraclides) and one would have to take (5) as an alternative title for all the others and not just perhaps for (4).

But there are other coincidences, concerning other authors as well.²⁷ One coincidence will be considered below (sect. 4): it is with some titles in the Hippocratic Corpus. The title [I.3] *On the Things in Hades* also recurs in the list of the titles attributed to Protagoras (cf. Diogenes Laertius IX 55 = 80 A 1). Furthermore, there are some titles in Theophrastus' catalogue which either coincide or are similar, namely the following three titles '*On the Images*, one book, *On Flavours, Colours, Flesh* [in the plural], one book, *On the World-system*', following closely the title *On the Astronomy of Democritus* (one book): in between there is a work *On meteorology* (Περὶ μεταρσιολεσχίας, one book) (cf. Diogenes Laertius V 43). Again these coincidences do not seem to be accidental, given that the work in between deals with topics of interest to Democritus.

In the case of the coincidences with the titles of the Hippocratic Corpus it is sufficiently clear, as we shall see, that they are suggested

²⁷ A survey is given by Nietzsche in op. cit., 213, which however includes too much on one hand and leaves out of consideration the Hippocratic Corpus on the other hand.

by a coincidence in subject-matter and, to some extent, in approach between the works which receive the same titles. It can be conjectured that the same explanation can be extended to the works of Heraclides Ponticus and Theophrastus. But one has also to conjecture that, since the proximity of the identical or similar titles with a title explicitly concerning Democritus is not likely to be accidental, all these catalogues were originally compiled by the same person, who was aware of the points of contact between the works of these other authors and the works of Democritus. The similarity, in the subdivision of topics, between the catalogue of Democritus and that of Heraclides Ponticus confirms this suspicion at least in this case. But this author cannot have been Thrasyllus, for there is no testimony that he compiled other catalogues beyond those of Democritus and Plato, there is no trace in them of his own way of working (classification by tetralogies), and, as we shall see (next sect.), he intersperses comments in the catalogue of Democritus which show that he is not familiar with the contents of his works. It has to be concluded, rather, that Thrasyllus manipulated a pre-existing catalogue of Democritus' works.

4. *The catalogue of Thrasyllus: a survey of its contents*

The titles listed in Thrasyllus' catalogue, as reported by Diogenes Laertius, give rise to problems for which it is difficult to find an answer. There are some cases in which a double title is given, but, since this is not Thrasyllus' usual procedure (in contrast with the procedure he adopts in the catalogue of Plato's books), it is not clear why this happens. This fact however, since the Greek particle for 'or' (ἢ) can easily be left out by the copyist or may even be inserted by mistake, can lead to discrepant views about the sequence of titles within a group or tetralogy. (An example will be given immediately.)

There are some uncertainties about the relations that occur between certain titles for other reasons as well (as we shall see). Another question is why all of them are not quoted in the Ionic dialect but some in Attic. Some problems are raised by the condition in which the text has come down to us: there are some cases in which the number of books constituting one work is missing (though required by the fact that the title is given in the genitive) and some cases in which the text is unsatisfactory and requires some correction. (In my collection I adopted the corrections, suggested by previous editors and other

scholars, which seemed to me more plausible. I cannot discuss all these details in what follows.)

There is also the question: what do these titles stand for? Diogenes Laertius, in introducing the catalogue, writes of 'books' (*biblia*), but some of these works include more than one 'book'. This ambiguity is probably not serious, given that a single work may be longer than one roll of paper and be subdivided in parts called 'books'. But are all the other works each the equivalent of one roll of paper? It seems more likely that in some cases the works are shorter, so that we have to talk of opuscles, as in the case of certain of Theophrastus' works. For instance, it is difficult to suppose that a full-length book was dedicated to the description and explanation of the action of the magnet, when the summary given by Alexander is much shorter than that.

The first group of works are those called 'ethical'. The first title, as we already know, is *Pythagoras*, the third is *On the Things in Hades* (or *On those in Hades?*). About the first there is the question as to whether it is authentic, about the third there is the question as to whether it can be regarded as ethical. This second question can also be asked about a title in the second tetralogy: *The Horn of Amaltheia*. Both questions will be discussed below. The last title in the first tetralogy, *Tritogeneia*, is accompanied by the remark: 'so called because from her three things are generated which keep together [or embrace: *sunechei*] all human affairs'. It is not clear whether this, and other similar remarks that are interspersed in the list, belong to Thrasyllus or to Diogenes Laertius. The facts that they are rather well-embedded in the list and that no similar remarks are to be found in the other catalogues in Diogenes Laertius tend to favour the first hypothesis (so Mansfeld, 1994, 102). Furthermore, there is one case, as we shall see, in which we can have some confidence that the remark was not made by Diogenes Laertius, and it is plausible to extend this to the other cases. As to its meaning, *Tritogeneia* is an attribute usually applied to Athena, but the reference to this goddess must be understood allegorically, as regarding *phronesis*, which is to be taken as the source of counseling well, speaking well and acting well (this is testified by an *Etymologicon* and some scholia, cf. B 2 = 191.1.1–5). From the remark as it stands, however, it is clear that the title of the work is justified by the fact that three things are generated, but what they are is not clarified.

The second tetralogy includes (in addition to the already mentioned *Horn of Amaltheia*), a work with a double title: *On Manly Excellence* (Περὶ ἀνδραγαθίας) or *On Virtue, On Contentment* (Περὶ εὐθυμίας), and *Ethical*

Commentaries. Of these works the one that was best known in antiquity, because either its title was explicitly mentioned (it was by Seneca) or because the topic of contentment was connected with Democritus, is that *On Contentment*. To the list of these four titles the following comment is added: 'For (γάρ) *Well-being* (Εὖεστώ) is not to be found'. The most obvious sense of this elliptical comment is that this title is not included in the catalogue, because the work was not available in the library visited by Thrasyllus himself or by the author who is his source. The comment is surprising, because it is plausible to admit that this must have been an alternative title for *Περὶ εὐθυμίας*, as emerges from Diogenes Laertius' piece of doxography on Democritus, where he says that the (final) end (τέλος) for him is contentment (εὐθυμία), but that he also called it well-being (εὖεστώ) and used other names (cf. IX 45 = A 1 = 4.1).²⁸ So the comment should not come from Diogenes, who was aware of the fact that the difference is only in *denomination*, but from Thrasyllus (on his own or depending on his source), and tends to show that his knowledge of the contents of Democritus' works was not good.

One supposition made by Nietzsche, who is followed by Natorp on this point, is that the title (so far not mentioned) *On the Disposition of the Wise Man* is not the second title in the list but an alternative title to *Pythagoras*, with the implication that Pythagoras was taken as an example of wise man as part of an illustration of what a wise man should be like. This requires an intervention on the text (the insertion of an 'or' between the two titles) and the admission that the work entitled Εὖεστώ, of which it is said that it could not be found, constitutes one of the titles listed there, so as to obtain two tetralogies. This is not satisfactory, since the γάρ shows that the work is not mentioned as part of the list but for another reason, as we have seen. It cannot be excluded, on the other hand, that Thrasyllus put these titles first in the list because he saw some connection between them, Pythagoras being no doubt taken by him as exemplifying the wise man. There would thus be a partial parallel with the first tetralogy of the Platonic dialogues, which (as Diogenes Laertius points out in III 57) is supposed to give an illustration of what philosophical life should be.²⁹

The second group of titles are the 'physical' ones or those about nature. The first tetralogy seems to concentrate on cosmology and

²⁸ This point is confirmed by the doxography of Arius Didymus (cf. A 167 = 131) and by that of Clement of Alexandria (cf. B 4 = 132.1).

²⁹ This suggestion is made by Tarrant (1993) 86.

perhaps on cosmogony: *The Great World-system*, *The Little World-system*, *Cosmography*, *On the Planets*. About the first there is the remark that 'Theophrastus says it was written by Leucippus'. There is also probably some interconnection in the case of the works which constitute the second tetralogy. The first title, *On Nature* (Περὶ φύσεως), is followed by: *On the Nature of Man* (Περὶ ἀνθρώπου φύσις), and these two titles are followed, respectively, by the indications 'first' and 'second', which presumably stand for 'first book' and 'second book'. This makes sense if the two titles apply to two different books of the same work, which should bear the general title *On Nature* and have to do with the world in general and with man (in this case the first title should correspond to the title *On the Nature of the World* [Περὶ φύσεως κόσμου] which appears in the article *Demokritos* of the *Suda*, cf. A 2 = 0.2.2). The second title however is followed by a curious alternative title: *On Flesh* (Περὶ σαρκός), both titles coinciding with the titles given to two writings belonging to the *corpus Hippocraticum*. And there is a discrepancy between the first and the second title in the list, for the first is in the Attic dialect and the second in the Ionic dialect (like the Hippocratic titles). This situation can raise some doubts about their reliability.

Concerning the remaining two titles in this tetralogy, that is *On the Intellect* (Περὶ νοῦ) and *On the Senses*, they are accompanied by the comment that 'some put these together under the title *On the Soul*'. If it can be admitted that the title *On the Nature of Man* concerns man in his bodily functions (see below), these other two titles are complementary to this, since they concern man in his psychic functions. There are no other titles in the catalogue which concern man's soul taken as a whole (perhaps the title *On Images* is of a work which dealt with functions such as dreaming which were taken to depend on the reception of images [*eidola*] from the objects). One can find it surprising that the treatment of the soul is supposed to be reduced to the treatment of the intellect and the senses. In fact this corresponds to Aristotle's account of Democritus' psychology in his *De anima*, which is taken up by his commentators and by the doxographers: according to this account there is a coincidence between the soul and the intellect (cf. *De anima* I 2, 404a27-31 = A 101 = 101.1, also 405a5-13 = A 101 = 102.1, further Alexander, *De anima* 27.4-8 = 105.2, not in DK, and Aetius IV 5, 12 [Stob. I 48, 7(2)] = 28 A 45 = 105.5). The question, to which it is difficult to give an answer, is whether Aristotle's account is really adequate or not. (It can be noticed that Philoponus regards that assertion of coincidence as an inference drawn by Aristotle, though an inference

he defends as legitimate, not as reproducing something explicitly stated by Democritus himself, cf. A 113 = 105.3.) In the second case the author of the catalogue would probably not have consulted Democritus' works directly, but would be giving titles which reflect an *interpretatio aristotelica*. In any case it has to be noticed that he makes his comment about the possibility of putting the two works under one comprehensive title in a non-committal way, while an adjective or an adverb would have been enough to make it clear whether he regarded that operation as justified (in relation to their contents) or not. This again is a sign of poor familiarity with the works themselves.

Coming back to the alternative title mentioned above: *On Flesh* (Περὶ σαρκός), one cannot see what sense can be given to the Greek substantive *sarx* if not that of 'body' (it seems that it is taken in this sense by Plato in *Timaeus* 61c, and by Empedocles, fr. 98, v. 5). The title itself can hardly be Democritean, for, on the basis of the evidence we have, Democritus used, to indicate the body, the word σῆμα and perhaps also σῶμα but not this other word. If this alternative title throws light on the contents of a work entitled *On the Nature of Man*, one has to conclude that it concentrated on the description of the body, and thus had to be complemented by further works (those indicated by the titles *On the Intellect* and *On the Senses*) concerning the soul. In fact the Hippocratic work with the same title (though in the plural: Περὶ σαρκῶν) offers a description of the human body in its overall organization and in its single members. The same happens in the pseudo-Hippocratic letter (*Epistula XXIII* = 68 C 6 = 136.1.1) which purports to reproduce what Democritus had to say about the nature of man, with manifest reference to this title (I come back to this in the next section). The Hippocratic treatise entitled *On the Nature of Man* is more concerned with the main constituents of the human body (i.e. with the four humours corresponding to the four Empedoclean elements in the world) than with its organisation and also gives an account of diseases on the basis of his theory, but clearly belongs to the same field of inquiry. These coincidences make one suspect that the author of the catalogue adopted titles that had some currency to designate topics he knew were dealt with by Democritus rather than having come to them on the basis of a familiarity with the corresponding Democritean works.

The titles of the fifth tetralogy following the title *On the Senses* are *On Flavours* and *On Colours*. This succession and the titles themselves can be explained without difficulty: from Theophrastus' *De sensibus* it is clear that Democritus treated in a rather detailed way not only the

functioning of the senses but also the generation of the perceptible properties, concentrating mainly on giving an account of flavours and of colours.

The next title, *On different Configurations* (or *On the Differences of Configuration*: Περί τῶν διαφερόντων ἑνισμῶν) introduces a term which is of importance for Democritean atomism: ἑνισμός. There is some connection between this title and the successive one: *On Changes of Configuration* (Περί ἀμειψιγενισμῶν). I shall discuss their meaning in the next section, since we also have to deal with the question of whether the former title coincides with an apparently different one given by Sextus Empiricus. As to the first title of the sixth tetralogy (fourth tetralogy of the physical works): *Confirmations* (Ἐξατυντήρια), in this case it is clear that there is a reference to a work with this title in Sextus Empiricus, *Adversus mathematicos* VII 136 (= B 9 + B 10 = 60.1). But its meaning requires a separate discussion (given below, in sect. 6), especially since the quotation of the title is accompanied by a comment which is in need of explanation.

The successive two titles (for one work): *On Images* or *On precognition* (Περί εἰδώλων ἢ Περί προνοίας), may indicate that the theme or one theme of the work was the physical explanation of psychic phenomena like premonitory dreams and telepathy or even the evil eye. (Democritus' interest in these phenomena is detectable in certain testimonies like those by Plutarch, cf. A 67 [= 110.4 and 5].).³⁰ These are followed again by two titles for one work: *On Logic* (or *On Logical Matters*: Περί λογικῶν) or *The Rule* (or *Canon*: Κανὼν); there is also the indication 'three books'. The second title is referred to twice by Sextus Empiricus, using the plural Κανόνες (cf. B 11 = 60.1, and B 10b = 60.4 [much more extensive quotation]), perhaps because of the number of books (as Diels suggests) or perhaps because he is influenced by the fact that a plurality of criteria was attributed to Democritus (as he himself testifies in *Adversus mathematicos* VII 140, quoting Diotimus, but probably as the result of a confusion between the position of Democritus and that of Epicurus).³¹ This criterion (or these criteria) is in the first place one of truth or knowledge, and must belong to a study which corresponds to the 'canonic' of Epicurus, which tended to be associated with physics (cf. Diogenes Laertius X 30). So the collocation of this title in the class

³⁰ On this topic cf. Bicknell (1969) 318–326, and (1970) 301–304 (but some of his suggestions go beyond the evidence).

³¹ On this issue cf. Striker (1974) 57–59.

of the physical works is not surprising. As to the first title, it suggests that the discussion of questions of epistemology (clearly suggested by the title and by the evidence given by Sextus) was accompanied by a discussion of logical questions, at least in so far as methodology is concerned. What Sextus says about Democritus' questioning the validity of demonstration (*apodeixis*) in *Adv. math.* VIII 327 (= B 10b = 60.4), taken in the sense of inference from the evident to the non-evident (as the context, omitted in Diels-Kranz, shows), is in conformity with this suggestion. One cannot expect, on the other hand, that the work, which is in any case concerned with epistemology, could constitute a sort of treatise of logic, which is not likely to have existed before Aristotle. So the title should not be taken in the later sense of the term.

As to the last title in the group: *Problems* (Ἀπορημάτων), the Greek is in the genitive, but without the indication of the number of books. It is not referred to by Sextus or any other author and could indicate contributions belonging to the same field to which the other works must have contributed. What has to be noted, however, is that while *Confirmations* and *The Canon* certainly contributed to what the Epicureans later called 'canonic', it can be doubted that the work *On Images* or *On Precognition* belongs to this same field, given its likely contents (as stated above). It may have been placed there to preserve the tetralogical order, without much concern for its contents.

In the catalogue there is, furthermore, a series of nine titles which are not ordered tetralogically and which manifestly dealt with rather specific naturalistic questions (for example the title *On the Stone* must have been about the so-called Heracleian stone, that is about the magnet, the action of which had attracted the attention of more than one naturalist, including Democritus, as Alexander and Psellus testify, cf. A 165 = 89.1 and 89.1.2). Almost all of these works have titles of the type: 'Causes of ...' (or 'causes concerned with ...', e.g. with fire). We have testimonies for contributions by Democritus on almost all these topics (see sects. IX and X in my collection of texts), but in most cases we cannot tell whether they come from the specific works or from works which deal more generally with nature and with the world. In some cases certainly the contributions are so detailed that it is likely that they come from a work devoted to the topic. This is true for instance of those about which Aelian gives us information in his *De natura animalium* (cf. A 150a, 151, 152, 153, 154, 155, 155a [= 96.8, 96.7, 97.3, 98.5, 98.6, 98.7, 99.3]): all or most of these must come from the work entitled *Causes Concerned with Animals*.

The next group is made up of the titles of the mathematical works. The first title: *On the Difference in an Angle* or *On the Contact of Circle and Sphere* (Περὶ διαφορῆς γωνίης ἢ Περὶ ψαύσιος κύκλου καὶ σφαίρης) is difficult. I have adopted the correction suggested by Thomas Heath (in *A History of Greek Mathematics*, vol. I, 178–179), for in this way, as he points out, it is possible to give it a wholly understandable mathematical sense.³² The text offers two variants: *On a Difference of a Gnomon* (Περὶ διαφορῆς γνώμονος) and *On a Difference of Opinion* (Περὶ διαφορῆς γνώμης). To the first it is difficult to give any mathematical sense at all. The second is preferred by Paul Tannery (*La géométrie grecque*, 122–123), who is followed by Hermann Diels and by other scholars. They adopt this title on the supposition that Democritus took up a stance on the argument that was used by Protagoras against the objectivity of the mathematical disciplines, namely that the point of contact between a circle and a straight line does not consist, as they assume, in a single point, for this does not happen in nature (for this argument cf. Aristotle, *Metaphysics* III, 998a2–4). However there is no testimony, apart from this title, that Democritus took up a stance on this issue. Even if he had done so, it remains more likely that the work received a title that is of a properly mathematical type, while the other is rather vague, and the term γνώμη was used by him in the more precise sense of ‘cognition’, as Sextus Empiricus testifies (cf. B 11 = 60.1).

The two subsequent titles: *On Geometry* (Περὶ γεωμετρίας) and *Geometricorum* (Γεωμετρικῶν, without indication of the number of books, in most MSS, Γεωμετρικόν in the singular in one MS), give rise to a different sort of problem: are they titles of different works or alternative titles of one? In either case it seems unsatisfactory that the second title is a mere variation of the first. The assumption that they are titles of different works requires (to respect the tetralogical order) that, in the eighth tetralogy, *Calendar* (Παράπηγμα) be taken as an alternative title of *Astronomy* (or at least as an explanation of the contents of this work). This solution (adopted in Diels-Kranz and in most other editions) is not satisfactory, for the ‘calendar’ (or ‘almanac’) in question is really a collection of forecasts about the weather based on some astronomical knowledge (for those attributed to Democritus cf. B 14 = 186.1–5), and

³² There were controversies about the nature of the ‘angle’ (called ‘horned angle’) formed, at the point of contact, between an arc of a circle and the tangent to it, and the ‘angle’ complementary to it (the ‘angle of a semicircle’) (cf. Procl. *In Prim. Eucl. Elem. Lib. Comment.* 121.24–122.6 Friedlein).

one cannot reduce a work entitled *Astronomy* to them. (For instance in the calendar attributed to Geminus for each zodiac sign there is the indication of the time that the sun takes to travel through it, e.g. 30 days, and for each day an astronomical phenomenon, e.g. the setting of the Lyre at some time of the day, is connected with some condition of the weather, e.g. stormy weather. Various authorities are quoted as having established those connections, and Democritus is one of them.)³³ Contributions of this type could at most constitute a *part* of the contents of a work with that title, which must also have included contributions to descriptive astronomy (Democritus' observations on the number of planets, on the galaxy, on the derived light of the moon, etc., are likely to have been taken as contributions of this type). It is not clear, otherwise, to which work these contributions could belong.

No doubt making this suggestion assumes that the title 'astronomy' is not applied, according to the later use, to a work with mathematical contents, hence does not really belong to the group of mathematical works. It is generally admitted that, for all we know, there was no mathematical astronomy in the proper sense in Democritus' days. The likely contents of the work entitled *Calendar*, i.e. forecasts about the weather, are based on some calendrical science and this involves mathematics in the sense of computation, but cannot be regarded as a contribution to a mathematical discipline. Another explanation that can be given of the title 'astronomy' depends on admitting that it is an alternative title of *On the Great Year*, considering this as a title which stands for a more comprehensive contribution to calendrical science, to which the contents of the work entitled *Calendar* was related, without coinciding with it.

Going on in this survey, the next titles are: *Numbers* (Ἀριθμοί) and *On Irrational Lines and Solids*, two books. It was noticed by Tannery (1887), p. 123, that the sequence suggested by these titles (starting with those on geometry) corresponds to the main topics of the *Elements* of Euclid: books I–VI on (plane) geometry, books VII–IX on numbers, book X on the irrationals and books XI–XIII on solid geometry (this requires taking the second book of the last Democritean title as being in effect *on* (περὶ) solids, though this particle is missing). This makes one suspect that the way in which the books of Democritus were catalogued and entitled, presumably in the library of Alexandria, was influenced

³³ On this topic one may compare Taub, *Ancient Meteorology*, ch. 2.

by knowledge of contemporary mathematics and not simply by familiarity with their contents (anyhow the titles are unlikely to go back to Democritus himself). The testimonies we have about his contributions to mathematics in the strict sense are only two, by Plutarch and by Archimedes (cf. B 155 = 27.1–2), and have a mainly geometrical character.

As to the next title: *Projections* (Ἐκπετάσματα), it is of a work which probably dealt with the projection of the terrestrial globe upon a plane, for this is how the term (which suggests the spreading out or flattening of a cloth for example) is explained by Ptolemy, *Geography* VII 7.³⁴ However this could be just one type of the projections which Democritus had in mind (see what follows).

Most of the next titles must be of works which dealt with applied mathematics, including astronomy, as follows: *The Great Year* or *Astronomy* (Μέγας ἐνιαυτὸς ἢ Ἀστρονομία); *Calendar*; *Contest of the Waterclock* (Ἀμύλλα κλεψύδρας); *Description of the Heavens* (or *Graphical Representation of the Heavens*: Οὐρανογραφία); *Geography*; *Description of the Pole* (or *Graphical Representation of the Pole*: Πόλογραφία); *Description of Rays of Light* (or *Graphical Representation of Rays of Light*: Ἀκτινογραφία). Of the contents of the first work we know very little, for the only relevant testimony is that of Censorinus (*De die natali* 18, 8 = B 12 = 185.1) according to whom Democritus admitted a ‘great year’ of 82 solar years (thus by ‘great year’ what is intended is a cycle like the one admitted by Meton, not a cycle concerning the world as a whole, as admitted by the Stoics). That Democritus offered any significant contribution to mathematical astronomy is not otherwise attested. The *Calendar*, as anticipated, has nothing to do with this, for it relies on the obvious subdivisions of the solar year and is not a contribution to astronomy (whether mathematical or physical) in the proper sense. On the contents of the third work it is hard to make any speculation, but perhaps it concerned the use of the waterclock to measure time in astronomy (as suggested by Tannery).

Of the next titles it is difficult to tell how much they were works of applied mathematics, in so far as they contained some graphical (thus geometrical) representation of the heavens and so forth, and how far

³⁴ Cf. apparatus in Diels-Kranz, 141, and Heath (1921) 181, and cf. Ptolemy’s *Geography* in the annotated English transl. by J.L. Berggren and A. Jones, Princeton 2000, 117; the reference by Diels, followed by Heath, to the armillary sphere must be anachronistic for Democritus and in Ptolemy concerns ch. 6 (the references by Ptolemy to Hipparchus in his *Almagest*, book V, chs. 1–2, suggest that this instrument goes back at best to him, cf. van der Waerden, 1988, 270).

they were non mathematical descriptions of their objects. Even geography, as understood by Ptolemy, consists mainly of cartography, which is distinct from regional cartography since it offers 'an imitation through drawing of the entire known part of the world' (these are among the introductory words to his *Geography*, book I, ch. 1). Whether Democritus already understood it this way remains uncertain. If he did, *Projections* (Ἐκπετάσματα) could be the collective title for this group of works rather than the title of a distinct work (another possible indication of Thrasyllus' lack of knowledge of the contents of the works he is classifying).

Democritus himself could be referring to this activity when, in a passage quoted both by Clement (*Stromata* I 15 = B 299 = 0.3.22) and by Eusebius (*Praeparatio evangelica* X 4, 23–24 = 0.3.22.1, not in DK), he speaks of the 'composition of lines by illustration [i.e. by drawing]' (I take *apodeixis* in a non-technical sense), saying that in this activity he was superior to the 'Arpedonaptes' of Egypt.³⁵ The passage is probably to be understood in the light of the conception that the Greeks had of the origins of geometry: they went back to Egypt, where the precise measurement of lands was necessary to restore the boundary lines between properties which were cancelled by the Nile in its frequent inundations (cf. Herodotus II 109, Diodorus Siculus I 81, and Proclus, *Commentary to Euclid*, prologue II, ch. 4, p. 64). The Arpedonaptes (Ἀρπεδονάπται = *rope-fasteners*) were, at least originally, the functionaries or scribes who had the task of taking those measurements. Democritus' claim is thus that his contributions to geometry were a substantial progress with respect to Egyptian geometry.³⁶

³⁵ The passage is in need of some corrections and probably reveals misunderstandings by the writer. The previous assertion attributed by Clement to Democritus: 'Democritus says these things', cannot constitute a confirmation of what precedes, but must serve as an introduction to the quotation which follows, and, when completed with 'about everything', coincides with an expression also attributed to him by Sext. Emp. *M* VII 265 (= 2.1) and by Cic. *Ac. pr.* II 23, 73 (= 61.1) (both = B 165 DK). On this matter see also above, sect. 1. What Democritus says about his travels etc. serves as the obvious justification for that claim, which must have been at the beginning of some work of his.

³⁶ The whole testimony by Clement is regarded as not authentic by Diels, who is followed by most scholars, since it refers to Democritus' alleged translation into Greek of 'Babylonian ethical discourses', and this cannot be a historical fact (see my discussion below, sect. 7). However it is not noted that the testimony on this point cannot be put on a par with the quotation from Democritus, for it is introduced with a 'it is told (*legetai*) of Democritus', thus is reported as a story told about him by other people, while the quotation is given as such and is likely to come from a work of his.

Another remark: the fact that a work with the same termination in—γραφίη, namely Κοσμογραφίη, is included in the list of the physical works may show that it was indeed somewhat arbitrary to collocate them under one heading rather than under the other; the separation of one title with this termination from the others may be even more arbitrary. It is not easy to see how the work entitled Πολογραφίη, which must have concerned the axis of the celestial sphere, could be distinguished from the work entitled Οὐρανογραφίη, unless it has to do with πóλος in the sense of sundial (the composite appears only in Democritus, according to LSJ), concerning either directly or indirectly its construction. As to the last title: Ἀκτινογραφίη, it can be conjectured it is the work that Vitruvius is referring to when talking of the contributions that Democritus, together with Anaxagoras, made to the treatment of perspective as adopted in theatrical scenery (cf. *De Architectura* VII prooem. 11 [= 59 A 39, referred to in 68 B 15b = 190.1]).

The next group consists of the so-called musical works, which in part concern questions of poetry but also, it seems, questions of grammar (cf. above, sect. 2). As anticipated above, ‘music’ here is to be taken in a wide sense, so that poetry can be regarded as belonging to this field, though having its own specificity (e.g. Plato, *Symposium*, 205B–C, talks of poetics as a form of production which has to do with music [μουσική] and verses [μέτρα], but it is sufficiently clear that verses are concerned not only in their metrical form but also in their contents of discourses or stories told). Music in a more narrow sense is centred on rhythms, harmony and metre,³⁷ and this comes out from the catalogue, where the first title in the list is *On Rhythms and Harmony* (Περὶ ῥυθμῶν καὶ ἁρμονίης). It can be supposed that the second title in the second tetralogy: *On Song* (Περὶ ᾠοιδῆς) is of a work concerned with song primarily from the musical point of view (rather than for its poetic contents). The rather curious title (fourth in the first tetralogy): *On Euphonious and Dysphonious Letters*, concerns a work the contents of which can be determined only in a rather speculative way.³⁸ It can be observed that Aristotle regards the differences in sound presented by the various letters (of the alphabet) as being of concern to the experts in metric (cf.

³⁷ This distinction in three main branches is suggested by book I of the work *On Music* by Aristides Quintilianus; the first two branches are also mentioned by Plutarch (or Ps.-Plutarch), *De Mus.* ch. 33.

³⁸ For some arguments on this topic see the contribution by Aldo Brancacci to the present volume.

Poetics 20, 1456b30–34 and *De partibus animalium* II 16, 660a3ff.), so it can be suspected that the work was, at least to an important extent, a contribution to metric. It is true, on the other hand, that the work *On Song* must have also been concerned with the topic, but we should not suppose that these titles stand for books of any length.

Of his contributions to poetics we know something from other sources, in particular, we are told of his admission of some sort of poetical 'enthusiasm' or inspiration (cf. B 17–18 = 115.1–4). It is possible that this view was introduced in his work *On Poetry*. There are various passages which show his interest in Homer: in addition to a direct comment on his ability as a poet (for which cf. B 21 = 115.5), there are references to him in various connections (e.g. about the *eidola*, by Ps.-Plutarch and Eustatius, cf. 110.1.2–4, not in DK, and about the being out-of-mind ascribed to Hector, cf. Aristoteles, *De anima* I 2, 404a27–31 = 68 A 101 = 101.1, and *passim*). To which work each of these contributions belongs remains a matter of speculation, for one cannot assume they all belonged to the work *On Homer*.³⁹

The title *On Homer* is accompanied by the alternative title: *On Correctness of Diction and On Glosses* (ἡ (Περὶ) ὀρθοεπείης καὶ γλωσσῶν). One is induced to suppose that this serves to qualify the approach of Democritus to Homer and show that he was concerned with the appropriateness of epic diction and the words (rare or not) used by the poet (this is the sort of interpretation that is propounded by Frommüller, 1901, pp. 10–13). On this view it is certainly excluded that everything Democritus has to say on Homer can be traced back to this work, but of course he was not obliged to speak of this poet in just one work. One question that arises in this connection is whether the concern with correctness of diction (*orthoepeia*) which is attributed to Protagoras by Plato, *Phaedrus* 267C (= 80 A 26), has some relation to this work attributed to Democritus. In what the contributions consisted which Protagoras gave to this field is not explained by Plato. It seems however plausible to suppose that his distinction of certain forms of discourse, such as questioning, praying, commanding, belonged to it (cf. Diogenes Laertius IX 53–54). It is of relevance for the interpretation of a poet like Homer, for Aristotle, in a discussion devoted to the topic of diction (*lexis*), testifies that the sophist blamed this poet for using the form of expression for a command when he intended to make a prayer (cf. *Poetics* 19, 1456b13–18 = 80 A 29). It

³⁹ For a detailed discussion of these contributions by him, in addition to Brancacci's contribution, one can refer to Frommüller (1901).

may be the case, however, that Democritus was more concerned with distinctions having a greater aesthetic significance.

It is also difficult to say whether the work entitled *Onomastic* concerned mainly questions of vocabulary or dealt with the question of the correctness of 'names' (*onomata*), whether natural or conventional, this being an issue on which (as Proclus testifies, cf. B 26 = 129.1) Democritus took sides. It may certainly be significant that Plato, in this connection, speaks of an 'onomastic' art (cf. *Cratylus*, 423D and 424A). (Diels was more inclined to associate this contribution to the work entitled *On Words* [or *On Verbs*], Mansfeld, in *Vorsokratiker* II, to the one concerning *orthoepeia*, intending this as concerning correctness of language, but while the former possibility cannot be excluded, the latter does not seem likely in the case of a work which also dealt with *glossai* and which concerned Homer.)

The tetralogies XII and XIII are of the works that are called 'technical' and which, from their titles, actually appear to have been technical in a proper sense: they concerned medicine, agriculture, painting, and so forth. The titles included in the first of these tetralogies: *Prognosis*, *On Diet* or *Dietetics*, *Medical Cognition*, *Causes Concerning Appropriate and Inappropriate Occasions*, all seem to have to do with medicine, though the fourth has a title which has some similarity with the titles of the works not ordered tetralogically. From the testimonies we have there are no indications that Democritus offered significant contributions to the determination of the nature of illnesses and their cures (for instance he is mentioned in the Anonymus Londinensis for an anecdote, cf. 68 A 28 = 0.4.1, not for his medical contributions, and his role in the pseudo-Hippocratic letters has little to do with medicine in the strict sense). This however does not seem to be a reason for regarding all the testimonies which suggest he had some place in the history of ancient medicine as spurious, being testimonies which in fact regard Bolus of Mende, as Diels assumed following Wellmann (e.g. the rather generic testimony of Celsus, *De medicina* I, prooemium, 7–8, is treated in this way, cf. 68 B 300.10 = 188.1–10).⁴⁰

The case of agriculture is different. The first title in the last tetralogy: *On Farming* (Περὶ γεωργίας), is accompanied by a second title: Γεωμετρικόν, which is probably to be corrected to Γεωργικόν, since it would belong to mathematics, unless we understand the term in its original

⁴⁰ For more on this issue I refer to Gemelli Marciano's contribution to the present volume.

sense (*Concerning Land Measurements*, in Hick's translation). As to Democritus' contributions to the field, there are some general testimonies about their importance by Varro, Columella and Isidorus (cf. 68 B 26f. = 189.1–4). However the information we have about actual contributions to the field are suspect (cf. 189.5–15). Some of these must go back to a work *On Sympathies and Antipathies* (cf. Columella XI 3, 64 = B 300.3 = 189.8) which with all likelihood is due to Bolus of Mende (see below, sect. 7); and, in one case, something that is attested for Democritus by Columella (cf. VI 13, 28 = 189.9, not in DK) is attested by Aristotle for another author whose position is distinguished from that of Democritus (cf. *De generatione animalium* IV 1, 765a3–11, 765a21–25 = 189.9.1, not in DK). Of the contents of the work [XIII.2] *On Painting* nothing can be said, unless what is testified by Vitruvius in *De Architectura* VII, prooem. 11 (= 59 A 39 and 68 B 15b = 190.1) concerns this work rather than Ἀκτινογραφίη. The two last works in the list, *Tactics* and *Fighting in Armour*, are probably spurious (see below, sect. 8).

5. *Titles from other sources*

Certain titles which appear in Thrasyllus' catalogue are also referred to by other authors. There are also references to Democritean works under titles that do not appear in the catalogue but about which one may ask whether these are alternative titles for works in the catalogue. For some of these titles there is also the question of what they mean. One also needs to determine the titles of works that are not authentic, but this point is not restricted to those referred to by other authors and will be discussed separately (below, sect. 7). I give a survey of this evidence and discuss open questions following, to some extent, the order of the titles as they appear in the catalogue, but to some extent deviating from this order, so as to take into account the manner in which they are presented in our sources.

A reference to the first title, *Pythagoras*, is made by Thrasyllus himself in the passage quoted by Diogenes Laertius (in IX 38 = A 1 = 0.2.1) and already considered above (sect. 2). The question of authenticity will be discussed below (sect. 7). The work entitled *On Things in Hades* is mentioned by Athenaeus in connection with the anecdote about Democritus having been put on trial by his fellow-citizens for having squandered his inheritance and having been found not guilty through the reading of two of his works, one of them being the one mentioned

(cf. *Deipnosophistae* IV, 168 B = 68 B oc = 0.3.23). The same anecdote appears in Diogenes Laertius, IX 39–40, who in his turn quotes three different sources, and in Philo of Alexandria (cf. A 14 = 0.3.18): there are some discrepancies in the details, but the work mentioned is still the *Great World-System*, which for Athenaeus is the other work read by Democritus.

The work entitled *On Things in Hades* is mentioned by Proclus as well (cf. *In Rempublicam* II 113.8–9 = 68 B 1 = 109.3), with a slight variation in the title which does not seem to be of importance, and there is also a sufficiently clear reference to it in the pseudo-Hippocratic *Epistula* X (cf. 68 C 2 = 0.3.10). It thus seems to have been one of the best known works by Democritus. The fact that a work with the same title is also attributed to Protagoras and Heraclides Ponticus (see above, sect. 3) probably only means that they took it as their model, just as later authors did with *Peri euthumies*.

The title *Περὶ εὐθυμίας* is actually adopted by Plutarch, who, however, though referring to the motif of ‘not doing many things’ (cf. *De tranquillitate animi* 2, 465C–D = 68 B 3 = 152.2) which, as we know from Seneca (cf. *De tranquillitate animi* 13, 1 = n. ad 68 B 3 = 152.3), appeared in that Democritean work, does not make any explicit mention of it. Seneca on the other hand does mention it (cf. *De tranquillitate animi*, 2.3 = 132.6 Le., om. DK). Clement, *Stromata* II xxi, 130 (= B 4 = 132.1), speaks of a work by Democritus with the title *On the (Final) End* or *On the Goal* (*Περὶ τέλους*), but this could be a conventional way of referring to the *Peri euthumies*, for the condition of contentment (*εὐθυμία*) is treated in the doxography as the end for man postulated by the philosopher (see above, sect. 4). In his turn Eusebius of Caesarea, quoting Dionysius (bishop of Alexandria), in *Praeparatio Evangelica* XIV 27, 5 (= 68 B 119 = 0.5.5), mentions a work entitled *Counsels* (*Ὑποθήκαι*). A work with this title is not mentioned in the catalogue and the question is whether it corresponds to one of the works appearing under some other title (see below, sect. 8 for a discussion).

The work entitled *Great World-System* is mentioned, in addition to the sources referred to above, by Achilles, *Isagoga* I 13 (= 67 B 1 = 82.3). It will be remembered that in the catalogue of Thrasyllus this title is followed by the title *Little World-system* but that there is the comment concerning it that ‘Theophrastus and his followers (οἱ περὶ Θεόφραστον) say that it is by Leucippus’. This indication, if it concerns Theophrastus himself (as is usually the case when that formula is adopted, though its adoption is surprising in a non doctrinal context) and is reliable,

is no doubt authoritative. It could receive some confirmation from the text of a papyrus from Herculaneum which is quoted as 67 B 1a in Diels-Kranz (= 0.6.2), but this has too many lacunae (even the name of Leucippus is inserted by a conjecture of Crönert) to offer any certainty. As we have seen, various sources attribute it to Democritus. One can only make suppositions about the origin of this discrepancy. It is possible that the work was actually written by Leucippus, presumably with the simpler title *World-System* which also appears, with a slight variation (*On the World-System*), among Theophrastus' writings (perhaps it is in this work that he mentioned a work with the same title to be attributed to Leucippus). But at some stage it was included among the works by Democritus and kept distinct from a work by Democritus himself on the same topic by means of the adjective 'great' (while that by Democritus was called 'little').⁴¹

The hypothesis now expounded requires that the distinction between the two works by the adjectives 'great' and 'little' does not concern their contents but is a conventional way of keeping them distinct, just as for instance among the Platonic works there is a *Major Hippias* and a *Minor Hippias* and among the Aristotelian works there is a *Great Ethics*, in spite of its being the shorter of the *Ethics* attributed to him.⁴² Some scholars, including Erwin Rohde⁴³ and Karl Reinhardt,⁴⁴ thought that the distinction has to do with their contents, in the sense that it reflects the distinction, which is admitted by Democritus (cf. 68 B 34 = 124.1), between macrocosm and microcosm: Leucippus would have dealt with the (physical) world as a whole and Democritus with man (taken as a 'little world'). However, as we have seen, in the catalogue of Thrasyllus there is a work entitled *On the Nature of Man* which must have been devoted to this topic, while, by excluding the *Little World-System*, we would be left with no work by Democritus devoted to cosmology and

⁴¹ It seems to me rather hazardous to accept the restitution of the text of the papyrus which is propounded by Crönert, according to which Democritus—who is not named at all—took over the contents of the *Great World-system* in his own *Little World-system*. But if one does so, the teachings in the two works being the same, there would be space both for the supposition of some ancient authors that Democritus was the original author of both works and for the supposition resulting from this restitution that he made use of a work which is by Leucippus. These hypotheses are developed by D. O'Brien (1994) 690–691, where this question is discussed in detail.

⁴² This suggestion was already advanced by H. Diels in an article criticising Rohde entitled *Über Leukipp und Demokrit* (Diels 1881).

⁴³ Rohde (1880).

⁴⁴ Reinhardt (1912).

cosmogony (even if one has to admit that this topic could have found some space in the *On Nature*). One would also expect that the distinction in question be suggested by the simple (Greek word) *kosmos* rather than *diakosmos*, which suggests the idea of system (or of ordering), this being identical (one could suggest) for man and world.

The title *Little World-System* is mentioned by Diogenes Laertius, in his chapter on Democritus, without any information about its contents, on the grounds that it contained some indication by Democritus himself on the date in which it was written.⁴⁵ It is surprising that Diels, though not on the basis of positive evidence, abandoned in his *Vorsokratiker* the explanation he gave (as against Rohde) of the origin of this title, and followed Reinhard's suggestion that certain texts containing an (anonymous) exposition of the origin of civilisation, starting with Diodorus' *Bibliothēke* I 8, go back to the *Little World-System* (cf. 68 B 5, pp. 134–137). Whether any of these texts show any influence by Democritus is a controversial matter, into which I cannot enter here, but, even if we come to a positive conclusion, there are no grounds for associating them specifically with this work.⁴⁶

There is another title of a work about which the question has to be raised whether it was written by Democritus or by Leucippus: *On Intellect* (or *On Intelligence*: Περὶ νοῦ). This appears in Thrasyllus' catalogue as IV.3 (and appears without any comment), but is mentioned as the source of a sentence by Leucippus confirming his adhesion to universal necessarism in a passage of Stobaeus concerning the topic of necessity (this is the only quotation we have of Leucippus and is given as fr. 2 of Leucippus in the collection of Diels and Kranz, cf. 70.1 Le.). There are other sources attesting that Leucippus, not considered in association with Democritus, adhered to a form of necessarism (cf. Diogenes Laertius IX 33 = 67 A 1 = 80.1; Hippolytus, *Ref.* I 12, 2 = 67 A 10 = 4.4). It remains however surprising that a work with this title should be attributed both to Leucippus and to Democritus. In the case of Democritus we can be confident that he had something to say about the intellect, since (as we have seen) he is supposed to have admitted a coincidence between it and the soul. In the case of Leucippus all

⁴⁵ This indication is of some importance in determining the dates of his life, and was discussed by Mansfeld (1983) 253ff., and by D. O'Brien (1994) 655–677, with discordant results, since the former relies on Apollodorus and the latter on Thrasyllus. I cannot enter into the details, but it can be seen from the present article that my faith in the reliability of Thrasyllus is not great.

⁴⁶ See also the reservations expressed by O'Brien (1994) 691–692.

the testimonies we have concern his cosmology (and cosmogony) or his physics (in the ancient sense of the term), and even the passage quoted by Stobaeus must concern this field, for the other sources talk of his adhesion to necessarism in this connection. There is thus not much ground for supposing (as can be done in the case of the *Great World-system*) that a work written by Leucippus was collocated among the works of Democritus. Should we suppose there is a mistake, or some omission, in the passage of Stobaeus, and that the quotation is of a sentence by Democritus, who certainly also adhered to a form of necessarism? Or should we suppose that, since it is not explicitly stated that the work is by Leucippus, the quotation is of a sentence of Leucippus contained in a work by Democritus? This is not the most obvious way of taking the passage of Stobaeus such as we have it, but perhaps it is the consequence of the omission of a context from which it was clear that the work belonged to Democritus but contained quotations of Leucippus.

The pseudo-Hippocratic *Epistula XXIII* purports to be an extended quotation of Democritus' work *On the Nature of Man*, i.e. the work listed IV.2 in the catalogue by Thrasyllus (cf. 68 C 6 = 136.1.1). What is in fact offered is an outline (ὁπογραφή) of 'human nature', which mainly concerns the human body in its overall organisation and its single members. This indication was taken seriously by one scholar, B. ten Brink in his 'Democriti liber περὶ ἀνθρώπου φύσιος' (*Philologus* VIII, 1853, pp. 414–424), who attempted a reconstruction of the contents of Democritus' work on this basis. However, though the general indication about what Democritus' work could have contained may be right (given the parallel with works of the same title, see above, sect. 4), one cannot claim that the description actually offered in this piece goes back to Democritus, except perhaps for some details (the expression 'receivers of tales' there applied to the ears recurs in Porphyry, *In Ptolemaei Harmonica* 32.10 [= A 126a = 119.2]). It is inspired by a hierarchical, finalistic and providentialistic conception of reality (see e.g. the mention of a *demiourgós* in §5) which is not at all Democritean. Furthermore, it makes use of anatomical observations which sometimes belong to a successive period.⁴⁷

This title is not mentioned elsewhere in the pseudo-Hippocratic *Letters*. There are however references to other works by Democritus in

⁴⁷ This was pointed out by Smith (1990) 33.

Epistula XVIII (cf. 68 C 5 = 0.5.4), namely, in the first place, to a work on the disposition of the world (Περὶ κόσμου διαθήσεως), of which it has to be asked whether it coincides with either the *Great World-System* or with the *Little World-System* or, again, with the work [IV.1] *On Nature*. The references are, in the second place, to a work entitled Πολογραφίη (this being title IX.3 in the catalogue) and to a work on the celestial stars, to which there is no precise correspondence in the catalogue. It can be added that a reference to *volumina de rerum natura* by Democritus is made by Vitruvius in his *De architectura* book IX, praef. 14 (= 68 B 300.2 = 0.6.4), but this is likely to be unreliable.

Sextus Empiricus, as already pointed out (above, sect. 4), mentions the work entitled *Canons*, surely coinciding with [VI.3] *Canon* (in the singular) in the catalogue, in *Adversus mathematicos* VIII 327 (= 68 B 10b = 60.4) and in *Adversus mathematicos* VII 138 (= 68 B 11 = 60.1); in the context of the second passage he makes a reference (in §136 = B 9 = 60.1) to the *Confirmations*, this being title [VI.1] in the catalogue, and (in §137 = B 6 = 60.1) to a work entitled *On Forms* (Περὶ ἰδεῶν), for which the problem arises as to whether it corresponds to some title in the catalogue. The same problem seems to be raised by the fact that a reference to a work entitled *On the Forms* (Περὶ τῶν εἰδῶν) is probably made by Theophrastus, *De sensibus* §51 (= A 135, p. 115.7 = 117.1).

On the basis of the assumption that the title [V. 3] *On Different Configurations* (Περὶ τῶν διαφερόντων ἔνσμιων) is of a work concerning the different figures presented by the atoms Diels admitted that the title given by Sextus is just an alternative title of this work (cf. *Vorsokratiker* II, p. 138, *ad* 51). In fact it is sufficiently well-documented that the atom was called *form* (ἰδέα) by Democritus himself (cf. Plutarch, *Adversus Colotem* 8, 1110 F [= 68 A 57 = 8.1], Scholium II to the *Hexahemeros* of Basilus [= 68 A 57 = 6.5], and Hesychius *s.v.* [= 68 B 141 = 192.6]). Diels' supposition is thus possible, but of course not certain. It is also not certain for the reason that we cannot exclude that the work was concerned rather with the configurations which the atoms assume in a composite body, i.e. with the way in which they are organised inside the compound, in view of giving an explanation of the differences which are presented by the compounds themselves. It may in fact be of significance that this title, in the catalogue, is immediately followed by a work entitled *On Changes of Configuration* (Περὶ ἀμεταβλησμοῦ), which must concern the configuration of atoms in a composite, not the figure possessed by a single atom, for the atoms by themselves are not susceptible to any change. It has to be remarked that the title introduces a word

that is explained by Hesychius (in relation to the verb ἀμειψιζοσμεῖν) as meaning a change of aggregation (σύγκρισις) or a 'metamorphose' (cf. B 139 = 192.2): the change of aggregation must concern the atoms inside a compound and the 'metamorphose' either the same situation or the change in (external) form of the compound as a consequence of a change in the organisation of the atoms inside. In fact the verb appears in this second application in the pseudo-Hippocratic *Epistula XVIII*, 382.1 Littré (= 68 C 5 = 0.5.4 Le.), if one accepts the restitution of a corrupt text made by this scholar (the correction adopted by Diels in *Vorsokratiker* II, p. 227.5 is similar).

Even if one accepts Diels' explanation of the first title, it is difficult to make the same supposition of a coincidence in the case of the title (if title it is) given by Theophrastus, since the Greek word used is *eidos* and not *idea* (even if it has to be conceded that this other word also occurs in Simplicius, *In Phys.* II 4, 327.25 [= B 167 = 72.3]) and since in the context there is no mention of the atoms, at least not in a direct way. It is probably for reasons such as these that an editor of Theophrastus, Schneider, wanted to correct the text to Περί τῶν εἰδῶλων, thus taking the passage to contain a reference to the title VI.2 in the catalogue. (Mansfeld, in his collection *Die Vorsokratiker* II, Stuttgart 1986, not only adopts this correction for Theophrastus, but extends it to the passage of Sextus. However there is more reason for such a correction in the case of the passage of Theophrastus, since in the context there is talk of *eidola*, than in the case of the passage of Sextus, since the correction would be of a larger import and cannot be given the same justification.)

Finally, to a work entitled *On Astronomy* (Περί Ἀστρονομίας), which must coincide with title VIII.2 in the catalogue, reference is made by Apollonius Dyscolus (cf. B 13 = 130.8) and in a scholium to Apollonius Rhodius (cf. B 14.5 = 185.5). A reference to the work entitled *Georgicon*, that is to say to title XIII.1 in the catalogue, is to be found in Columella (cf. B 28 = 189.5).

6. *On the work entitled Confirmations*

I come back to the first title of the sixth tetralogy (fourth tetralogy of the physical works): *Confirmations* (Κεραυνήρια). As pointed out above, there is a reference to a work with this title in Sextus Empiricus, *Adversus mathematicos* VII 136 (= B 9+B 10 = 60.1). According to his report, Democritus, 'although he had professed to give the senses control over

belief, is nonetheless found condemning them', and this condemnation is then illustrated by two quotations. The passage thus suggests that the work must have contained a discussion of questions of epistemology. Since what is at issue is a controversy concerning the reliability of the senses, it can be conjectured that Galen, in *On Medical Experience* XV 7 (= B 125 = 60.3), when quoting the well-known passage in which the senses are presented as replying to the intellect, calling it 'wretched mind' (τάλαινα φρεῖν), is making a reference to this same work. Between the two passages, beyond the coincidence in topic there is a coincidence in one important word (the word πίστις), and the topic is introduced by the quotation of the well-known Democritean sentence 'by convention ... in reality ...'. It is true that Sextus makes this other quotation before referring to the *Confirmations*, but this can probably be explained by the fact that the sentence also appeared in other works. (Another element in favour of this conjecture will be adduced below.)

So far so good. What gives rise to perplexities is the explanation which follows the title: 'which is examinative (ἐπικριτικά) of the previously mentioned ones'. If this remark is to have some sense inside the catalogue, it must regard the 'previous mentioned *works*' and cannot be taken to suggest that the examination concerns 'what has previously been said'.⁴⁸ This is confirmed by the article *Confirmations* (Κρατυντήρια) in the *Suda* (= 0.6.3, not in DK) where it is said explicitly that it is a book (βιβλίον) written by Democritus which is examinative or critical (ἐπικριτικόν) of all the books written by him. It is however surprising that Democritus should have written a work in which he submitted all the works (previously) written by him to a critical examination. Nothing to this effect is suggested by Sextus or by any other testimony. On this point there is also a discrepancy between the testimony of the *Suda* and the remark by Thrasyllus, which suggests that the examination is restricted to the previously mentioned works. But all of them or only some of them? And why only the previously mentioned and not those mentioned later in the list? Chronological criteria have no place in the catalogue.

We can try however to get around these perplexities if we ask ourselves the question whether the verb and the substantive from which ἐπικριτικός derives, namely ἐπικρίνειν and ἐπίκρισις, have a use in the field of epistemology. It is not at all difficult to give a positive reply

⁴⁸ So Taylor (1999) 67.

to this question: these terms were currently used by the sceptics (one has to add ἐπικριτός). For instance Sextus, in his *Outlines of Pyrrhonism* I, ch. 6 (§12) and ch. 12 (§26), suggests that the dogmatists, before the contrast (διαφωνία) presented by the appearances, tried to reach a decision (ἐπίκρισις) as to which of them is true and which is false. The sceptics, on the other hand, reject as groundless this attempt to make a decision. Similarly, in view of the contrast between what is grasped by the senses and what is grasped by the intellect, they admit that a decision cannot be made and suspend their judgement (cf. op. cit., I, ch. 12, §29; II, ch. 6, §§67–68 and 69). Also in other cases in which there is a contrast (διαφωνία) the question is raised as to whether a decision can be reached (e.g. *Adv. math.* I 9). The question as to whether a decision can be reached in the case of the contrast between the senses and the intellect is in any case quite standard, as is confirmed by the use of the same terminology in such a connection in Diogenes Laertius IX 92–93, when expounding (in his chapter on Pyrrho) the sceptics' position. It is superfluous to remark that this terminology is strictly connected with the term *kriterion*, which is currently used in the same connection.

Now what Sextus attests (and Galen with him) is that the contrast between the senses and the intellect was a central issue for Democritus as well, and that this issue was introduced in the work entitled *Confirmations*. If, in speaking of this work, it is explained that it mentioned some decision (ἐπίκρισις) to be taken, as before a judge or an arbiter (who in Greek can be called ἐπικριτής), one has to expect that this decision be taken about the reliability (suggested by the word *pistis*) of the senses and of the intellect in their contrast with one another. It can be suspected that the motif of a judicial controversy (διαδικασία), which, as Plutarch attests (cf. B 159 = 135.1–2), was introduced by Democritus about the issue whether it is the soul or the body which is mainly responsible for the evils in human life, was also introduced in this connection, and that this explains the use by Sextus of the word 'condemn' (καταδικάζω) in relation to his attitude to the senses. In any case the relevance of the motif of the decision (ἐπίκρισις) to be taken is sufficiently evident.

The explanation given about *Confirmations* must thus concern, as is most obvious, the content of the work and its title, not its relationship with some (not specified) or all the other works by Democritus, and the adjective used is quite appropriate to describe this content, as presented by Sextus. It is even possible that the formulation used, to be taken to mean 'discriminatory of what has been said previously', comes from the

source on which Thrasyllus depends (if he depends on only one source, which is not certain), but in this case it must have been at the end of a passage of some length from which it was clear that the decision was between the senses and the intellect. The passage should also have contained some explanation of the title *Confirmations* (Κρατυντήρια) which otherwise would remain unexplained. Probably this explanation had something to do with the expression actually used by Sextus: ‘... he had professed to give the senses control (κράτος) over belief (πίστις)’, for the verb *kratunein* is clearly related to the substantive κράτος, and can be used with πίστις as its object (cf. Thucydides III 82, 6).

One can try to go a little beyond this. In the passage quoted by Galen Democritus has the senses criticise the intellect for its attempt to overthrow them, and the Greek for ‘overthrowing’: καταβάλλειν was used in dialectical debates, at least for some time (as shown by the title Καταβάλλοντες given by Protagoras to one of his works, by the use of the verb in Hippocrates, *On the Nature of Man*, ch. 1, by similar uses of the verb in Plato, for example *Euthydemus*, 277D and 288A, *Phaedo* 88C, and *Republic* VII, 538D–E, and by its replacement later, for example in Sextus and in Diogenes Laertius, by the similar διαβάλλειν or even, in the case of a περιτροπή, συνεκβάλλειν, cf. *Adv. math.* VIII 364, with ἐκβάλλειν used in the case of ‘throwing one back *ad infinitum*’ and ἐπιβάλλειν used as their positive). The verb κρατύνειν suggests the opposite process of ‘confirming’ or ‘reinforcing’ by means of arguments, as shown by its use in Sextus Empiricus (cf. *Outlines of Pyrrhonism* I 147, where the example given of what is established is precisely the atomic theory, further II 96 and 259; *Adv. math.* VIII 364). The connection between these two verbs adds some weight to the impression that the passage quoted by Galen comes from the *Confirmations*. As to this title itself, if it does not come from Democritus himself, it must come from someone who was familiar both with its contents and the terminology of dialectic. The same person could have added the explanation that is now missing for the most part. The omission of most of the passage in order to keep the explanation brief, as one expects from a comment in a catalogue, led to the incomprehensibility of the explanation itself.

One has to conclude that the way in which this explanation is reproduced by Thrasyllus in his catalogue and by the author of the article *Confirmations* in the *Suda* reflects a serious misunderstanding of a comment that they must have found in their source (unless the author of that article changed what he found in Thrasyllus in the attempt to make sense of it). But, if this conclusion is right, Thrasyllus is shown to

have been unable to make a proper use of his source (or his sources) and to have had little, if any, direct knowledge of the contents of the works of which he gives the titles.

7. *Open issues*

In Diogenes Laertius, after the catalogue of works the titles of which are said to have been ordered by tetralogies by Thrasyllus, there is a list of nine or ten titles of works which are said to be ordered by some people separately from his *Commentaries* (Ῥπομήματα) (this probably means: from the notes left unpublished by Democritus). Scholars tend to admit that these works cannot be regarded as authentic. This is not said by the author of this passage, for the comment he adds after their quotation is: 'the other works which some ascribe to him are either compilations from his writings or else agreed to be (written) by others'. This clearly refers to further works, not previously listed, of which only a part is said (by general agreement) not to be by Democritus himself. He does seem to assume that all the titles he quotes are of works which are authentic. The reasons for questioning their authenticity are different. Before considering them (in the next sect.), the issue should be discussed whether this passage belongs to Diogenes Laertius or Thrasyllus.

It is sufficiently clear from Diogenes Laertius' presentation that this list is to be kept separate from the catalogue compiled by Thrasyllus, since the catalogue is said to consist of a list of books that are ordered (in Greek there is the expression κατὰ τάξιν) tetralogically, while these others are said to be ordered separately (from the rest) by some people (τάττουσι δέ τινες κατ' ἰδίαν), i.e. by people other than Thrasyllus. This tends to suggest the pre-existence of the catalogue of Thrasyllus, with respect to which they are ordered separately, unless this catalogue itself replaces another catalogue, with respect to which these titles are listed separately. In any case it is not impossible that Thrasyllus himself added this list (with those clarifications, thus simply quoted by Diogenes Laertius) as an appendix to his own catalogue. No doubt this is not the most likely explanation, for as the text now stands the list appears as a separate one made by others, and it is surprising that Thrasyllus does not make it clear whether it is a proper addition to his catalogue or not. And in this other case it is Diogenes Laertius who gave credit to those other people, without saying who they were.

So far, however, it was assumed that the main reason for ordering them separately is that they do not fit into the catalogue by Thrasyllus in which the titles (with the exception of the nine which have not been so arranged [$\alpha\sigma\acute{\upsilon}\nu\tau\alpha\kappa\tau\alpha$]) are organised tetralogically. The main reason however could be that they come from the *Commentaries*, this being one of the works of which the title was already given in the catalogue, namely the last title of the second tetralogy, there given as *Ethical Commentaries*. Furthermore, the first title in this list: *On the Sacred Writings in Babylon*, could be related to what Clement says of Democritus, namely that he appropriated the 'Babylonian ethical discourses', since he translated into Greek the monument (*stēlē*) of Akikarus (cf. *Stromata* I 15, 69 = 299 = 0.3.22). This suggestion, which apparently goes back to Mullach, is discussed by F. Lortzing⁴⁹ and Franz Susemihl.⁵⁰

No doubt this testimony by Clement cannot be regarded as reliable for the following reasons given here in the most synthetic form: (1) if that monument was ever built, it would no longer exist at the time in which Democritus made his travels and (perhaps) reached Babylon;⁵¹ (2) Strabo is one of the very few Greek authors who knew something of Akikaros (cf. *Geography*, XVI 2, 39, p. 762) and is also inclined to make Greek philosophy depend on oriental wisdom (he accepts the view of Posidonius that the atomic theory went back to Mochus, cf. XVI 2, 24, p. 757 = 68 A 55 = 0.8.6), but gives no indication that Democritus made some use of 'Babylonian ethical discourses'; (3) there is no close relationship between the testimonies we have about the ethical precepts of Akikaros (for which see Nau, 1909) and the ethical sentences by Democritus.⁵² Of course this would only confirm the impression that the titles belonging to the list which starts with *On the Sacred Writings in Babylon* cannot be regarded as reliable, but does not exclude that Thrasyllus himself thought that the list is one of works that are authentic.

On the suggestion under consideration it is clear that for Thrasyllus the *Commentaries* which are the source of the works indicated by the

⁴⁹ Cf. Lortzing (1873) 5–6.

⁵⁰ Cf. 'Aphorismen zu Demokritos', 183–184.

⁵¹ This is pointed out by Wilsdorf (1991) 191–206, in spite of his defence of the reliability of this tradition.

⁵² Nau (1909), though in favour of the hypothesis of a dependence of Democritus on Akikaros, is honestly obliged to write what follows: 'Nous reconnaissons que le points de contact ne sont ni aussi nombreux ni aussi frappants que nous pourrions le désirer' (p. 39) (in what follows he tries to find some justifications for this discrepancy, but these cannot be regarded as sufficient).

nine titles of this list coincide with the *Ethical Commentaries*, and that the difference between him and those who 'order' these works 'separately' is simply that he treated it as just one work (containing many books, the number of which is not indicated in the catalogue as we have it) belonging to the main catalogue, while these other people found it desirable to list these works (possibly corresponding to the books in which the work is distinguished) in a separate way. What should we think of this hypothesis? On the one hand the mention of a work entitled *Commentaries*, if it were sudden and wholly unprepared, would be surprising, while it would be natural to suppose it coincides with the one already listed in the catalogue and now quoted in an abbreviated form. On the other hand the titles actually given in this list are in part clearly not ethical (in particular *Circumnavigation of the Ocean*, *On History*, *On Fever and Coughing Sicknesses*, some others being not easily classifiable).

It cannot be excluded that Thrasyllus, in his carelessness, was influenced by the fact the first titles were ethical (at least they were in his eyes) and thus made an easy generalisation. It has in fact to be noticed that at least two of the titles he gives in the list of ethical works are not likely to be prevalently ethical. The first of these titles is *On Things in Hades*. From the testimony we have about it by Proclus, *In Rempublicam* II 113.6–22 (= 68 B 1 = 109.3), it is sufficiently clear that one of the topics dealt with in this work is the possibility of coming back to life of people taken to be dead. (It would also seem that the corresponding piece by Heraclides Ponticus was concerned with this sort of issues.) Of course concern with the destiny of man, with (no doubt) the exclusion of a survival of the soul after (definitive) death, has ethical implications which could have been developed by Democritus, but it is at the very least a simplification to classify it as ethical.

The second of these titles is *Amalthea's Horn*. This title is mentioned by Aulus Gellius, *Noctes atticae* I 8 and praef. 6, and by Pliny, *Naturalis historia*, praef. 24, and both explain it as meaning the horn of abundance (*cornu copiae*). This must have been a proverbial motif. From the indications that are to be found in both authors one can infer that the title was applied to works of various erudition or to miscellanies, often containing tales or anecdotes. (Gellius, who regards his own work as belonging to the genre, quotes one about Demosthenes.) Both of them refer to Greek works with this title, but Pliny gives no names and Gellius only mentions the Peripatetic Sotion.

In conclusion, regarding the main issue under discussion, it must be admitted that the parallel between these cases and the case to be

contemplated is not so close as to make it very likely that Thrasyllus would have been ready to regard works which are not ethical at all as belonging to *Ethical Commentaries*. So this must remain an open question, just as the problems raised by the following titles in the list of the ethical ones: *Tritogeneia* and *On Manly Excellence* or *On Virtue* (in this case in fact we have a double title). In the case of the first title it was noticed by Zeller (*Philosophie der Griechen* III 1, p. 339 and note 5) that a similar allegorical interpretation of Athena is to be found in Stoicism, where this surname of the goddess is understood as suggesting the division of philosophy into physics, ethics, and logic, since the wisdom (*phronesis*) incarnated by Athena consists in discourses (*logoi*) that are physical, ethical and logical (the testimony is by Philodemus and concerns the treatise *On Athena* by Diogenes of Babylon).⁵³ This of course conforms to the practice of allegorical interpretation current among the Stoics. The coincidence is not complete with what is attested for Democritus, for whom wisdom originates from reasoning well, speaking well and acting well (cf. 191.1–5), hence is not supposed to concern three fields of inquiry (acting well has to do with ethics, but both reasoning well and speaking well have to do with logic). Lortzing (1873), on the supposition that we cannot attribute the practice of allegorical interpretation to Democritus, regarded this coincidence, however partial, as suspect, and concluded that what is attested about him is a late construction (*späte Erfindung*, p. 5). However this practice was already current at the time of Democritus, so that one cannot exclude that he availed himself of it. The lack of other examples of allegorical interpretation in the testimonies concerning him should induce us to leave the question open. Further, even if it is admitted that the allegorical interpretation of this denomination of Athena goes back to him, one has to wonder whether it is a sufficient justification for adopting the denomination itself as the title of a work of his. One would expect that the work itself be divided into three parts in accordance with this tripartition (just as works by the Stoics would probably take into account the distinction of philosophy into three parts), but there is no trace of this subdivision in the documentation we have and there would probably be some artificiality in applying it. There is thus reason to doubt that this denomination really corresponds to a work by Democritus rather than being applicable to some of its contents.

⁵³ Cf. SVF III, Diogenes fr. 33, also D. Obbink, ed., Philodemus *On Piety* Part I. Critical Text with Commentary, Oxford 1996, 19–21.

As to the double title for the other work of Democritus, one has to wonder, in the first place, whether the second title (*On Virtue*) would be fully applicable to one of his works on ethics. It does not seem in fact that the topic of virtue has a central place in his ethics. On this point there is the testimony by Cicero, *De finibus* V 29, 87 (= A 169 = 133.2), that Democritus had spoken well of the supreme good, but had said little about virtue, and that rather obscurely; in what follows he adds that the inquiry about virtue had started with Socrates. No doubt this testimony is of a doxographical nature and goes back, in the main, to what Aristotle had already said about the role of Socrates in a few passages, of which the most significant is to be found in *De partibus animalium* book I, where he remarks that (in the case of the Pre-socratics) Democritus had touched only slightly⁵⁴ upon the definition of the essence, while in Socrates' time there was progress in this sort of inquiry, though the study of nature was left aside and the philosophers turned to useful virtue and politics (cf. 642a24–30 = A 36 = 1.1). This testimony by Aristotle was taken by Nietzsche as a reason to question the authenticity of all the contributions to ethics ascribed to Democritus.⁵⁵ However Aristotle is speaking of what happened at the time of Socrates rather than saying that only Socrates was interested in the field of ethical virtue (though he does suggest a certain temporal *décalage* between Democritus and Socrates which in fact does not exist). One gets the impression however (from this and other similar testimonies) that Aristotle wants to exclude that Democritus did what Socrates did in his treatment of the virtues, namely search for their definition. One could add that the topic of the relationship between virtue and happiness does not seem to have been central to Democritus' approach to ethics. So if the second title (which appears as the alternative title of a Platonic dialogue in Thrasyllus' catalogue of Plato's works) is intended to suggest that this is what Democritus did, it certainly is not appropriate. If it is only meant to suggest that among the topics of concern for Democritus in his ethics there were the virtues, there would of course be some justification for adopting it, but it would probably be open to the objection that a denomination is applied to

⁵⁴ The qualification 'only slightly' is suggested by the parallel passage of *Physics* II 2, 194a20–21 (= 1.2 Le, not in DK).

⁵⁵ Cf. *Nachgelassene Aufzeichnungen*, cit., 451 (= *Écrits*, cit., 768) (on the other hand, later in the same collection, i.e. P I 7, p. 457 [= p. 774], he admits the possibility that Democritus exercised an influence on Aristotle's ethical conceptions).

the whole which would be appropriate for a part only. As the title is not likely to go back to Democritus himself, this remains a possibility. The equivalence that is apparently propounded between *andragathia* and *areté* can also give rise to doubts, for it is not obvious that there is such an equivalence (the first title must regard manly virtue and make it coincide primarily with the virtue of courage), or that Democritus was particularly interested in manly virtue rather than in virtue *simpliciter*.

8. *Works of questionable authenticity or likely to be unauthentic*

The reasons for questioning the authenticity of the nine (or ten) titles of works which are said to be ordered by some separately from his *Commentaries* (Ὑπομνήματα) are as follows. The first is that in the case of one of these titles, *Hand-wrought Things* (or *Artefacts*: Χειροκμήτα) (probably artificial remedies are meant), there is the testimony by Columella that the work was wrongly ascribed to Democritus and in fact is by Bolus of Mende (cf. 68 B 300.3 = 0.8.24). The same work is mentioned, without any such reservation, by Pliny, *Naturalis historia* XXIV 160 (= 68 B 300.2 = 0.6.5), and probably also by Vitruvius, in *De architectura* book IX, praef. 14 (= 68 B 300.2 = 0.6.4), together with the above-mentioned *volumina de rerum natura* (I say 'probably' because the text needs a correction and other corrections have been attempted by scholars). Its mention by Pliny, far from invalidating Columella's testimony, tends to confirm it, since it is clear that this author (as Aulus Gellius declares) depends on sources that are not reliable. This testimony certainly pertains to just one title, but since all these works are said to have the same origin (in Democritus' supposed *Commentaries*), the suspicion must naturally be extended to the rest of the list. Furthermore, some of these titles are rather typical for works which were counterfeited: *On the Sacred Writings in Babylon*; *On Those in Meroe* (or probably: *On the Sacred Writings in Meroe*, abridged), *Chaldean Account*, *Phrygian Account*. And these are also titles which are appropriate for some of the material, to be found in Pliny and in other authors, which must be regarded as spurious.

For instance *Phrygian Account* (or *Discourse*: Φρύγιος λόγος) is a title which, curiously, but in the plural, is also that of a work of Diagoras of Melos (cf. Tatianus, *Oratio ad Graecos* 27 [= *Diagorae Melii et Theodori Cyrenaei Reliquiae*, ed. M. Winiarczyk, BT, Leipzig 1981, p. 21, T 68]),

but which in his case is not likely to be authentic.⁵⁶ It is the sort of title which is connected with some sort of mysterious wisdom requiring rites of initiation etc. (for instance it is associated with the Orphic poems and Egyptian Discourses by Plutarch, *De daedalis Platacensibus* fr. 157 Sandbach ap. Eusebium *Praep. evang.* III 1, 1 [= T 94 Winiarczyk]). Though he probably does not consider it as a title, a Phrygian discourse is contrasted by Plutarch (but within the same genus) with an Orphic or Egyptian discourse or even with a discourse by the Magi around Zoroaster (cf. *De defectu oraculorum* 10, p. 415A [= T 93 Winiarczyk]). It is probably not accidental that a *Chaldean Account* (or *Discourse*), to be treated as an alternative title for *On the Sacred Writings in Babylon*, was attributed to Democritus, and similarly, but implicitly, an *Egyptian Account* (or *Discourse*), also to be treated as an alternative title for *On the Sacred Writings in Meroe*, and (explicitly) a *Phrygian Account* (or *Discourse*). It was already pointed out by Franz Susemihl,⁵⁷ who is followed by Winiarczyk (art. cit.), that in late antiquity Democritus was supposed to have been influenced by the wisdom of the Chaldean Akikarus (see above, sect. 7), by that of Apollobeches, an Egyptian from Coptus (cf. Plinius, *Naturalis historia* XXX 9 = 68 B 300.13 = 0.6.9), and by that of Dardanus (ibid.). Actually Dardanus could easily be regarded as having inspired a *Phrygian Discourse*, since he was connected in various ways with Phrygia (as the progenitor of the Trojan leaders and founder of the mysteries devoted to the Phrygian Mother goddess).⁵⁸

At this point a survey of further titles, which are not listed by Diogenes Laertius but must be regarded as works that are not authentic, is appropriate. There is an *On Sympathies and Antipathies* (Περὶ συμπαθειῶν καὶ ἀντιπαθειῶν) published under Democritus' name, which was compiled in the Byzantine period (cf. 68 B 300.9 = 0.6.10.1). A reference to this title as that of a work by Democritus is made by Columella, who calls it Περὶ ἀντιπαθῶν, in *De re rustica* XI 3, 64 (= 68 B 300.3 = 189.8), this time without expressing reservations. However a work with the same title is attributed to Bolus of Mende in the *Suda* s.v. Βῶλος (= 68 B 300.1 = 0.8.23) and in a scholium to Nicander (cf. 68 B 300.1 = 0.8.25). This coincidence, given what Columella himself says about the ascription to Democritus of another work by Bolus, is very suspicious. And it is quite clear that in authors like Pliny and in the

⁵⁶ See the discussion by Winiarczyk (1980) 58ff.

⁵⁷ Susemihl (1891) I, 483, n. 132, and 484, n. 137.

⁵⁸ Cf. Clem. Alex. *Protr.* II 13.

above-mentioned Byzantine collection material of a very fantastic and unscientific brand is found, pertaining to sympathies and antipathies between animals etc., which is ascribed to Democritus and which must come at least in part from this work. An allusion to literature concerning the topic of sympathies and antipathies is in Plutarch, *Convivales quaestiones* II 7. From the passage it is clear that we are in the field of fabrications, and the examples there given are typical illustrations of such tales ('the sight of a ram stops a mad elephant', 'a viper is brought to a standstill by pointing an oak twig at her', etc.). These examples are quite similar to the rather fantastic tales told by Pliny. Bolus was certainly not the only author of a work on this topic.

In this connection it can be conjectured that certain more specific titles which are mentioned by Pliny as his source, namely a *De effectu herbarum* (in *Nat. hist.* XXV 13 = 68 B 300.6 = 0.6.5.1) and a book *On the Character and Nature of the Chameleon* (in *Nat. hist.* XXVIII 112 = 68 B 300.7 = 0.6.6), are in fact parts of a work with that general title. In any case the authenticity of the work on the chameleon is questioned by Aulus Gellius, *Noctes Atticae* X 12, 1 (= 0.6.7, not quoted but only referred to in Diels-Kranz under 68 B 300.7). Gellius devotes the whole chapter from which this passage comes to a protest against the ease with which Pliny quotes tales which are entirely fraudulent as being genuinely Democritean.

One writing which is quoted without reservations in the *Anecdota medica Graeca* (cf. 68 B 300.10 = 0.6.14.1) but with an expression of doubt by Caelius Aurelianus, *Tardarum passionum* liber IV, ch. 1, 4 (= *ibid.* = 0.6.14), that *On Elephantiasis*, is explicitly said to be unauthentic by Oribasius, *Collectionum Medicarum Reliquiae* XLV 28.1 (= *ibid.* = 0.6.14.2). We are otherwise informed that this illness was not known in Democritus' time (cf. Plutarch, *Quaestiones convivales* VIII 9, devoted to the question 'whether it is possible for new diseases to come into being, and from what causes', esp. 1, 731A–B). The fact that Caelius Aurelianus (who depends on Soranus) shows a not uncritical attitude in this case suggests that we cannot dismiss his testimonies concerning Democritus' contribution (in an unspecified work) on hydrophobia, given that this is a well-known illness for the period, as against Diels' over critical attitude (cf. *Celerum passionum* liber III, ch. 15, 120; *Celerum passionum* liber III, ch. 14, 112; *Celerum passionum* liber III, ch. 16, 132 [= 188.2–4, only reference in Diels-Kranz, 68 B 300.10, p. 216.7–8]). On the other hand, the writing *On Folly* (Περὶ μωρίας) which is quoted at the end of the pseudo-Hippocratic *Epistula* XVIII (cf. 68 C 3 = 0.6.15) is to be regarded as

certainly unauthentic, since what follows about its supposed contents (in *Epistula XIX*) is in fact a selection of passages from Hippocratic writings such as *De morbo sacro*.

The title *Physical and Mystical Things of Democritus* (cf. 68 B 300.18 = 0.6.13) is manifestly not authentic: the title itself is suspect, and belongs to the sphere of (magical) alchemy to which the four books on tincture, which are referred to by Synesius (cf. 68 B 300.17 = 0.6.11), belong. The writing entitled Ὑδροσκοπικόν (for which cf. 68 B 300.8 = 0.6.16 and 0.6.16.1) is also suspect, because the contents of the chapter in the *Geoponica* (i.e. II 6) which purports to come from this work (there said to be by Democritus) contains Hellenistic material.⁵⁹ It can be added that nothing corresponds to this title or to the previous one in the catalogue of Thrasyllus, and that all the lemmas adopted in the *Geoponica*, as we have it, are suspect.⁶⁰ What should we think of a work in which quotations said to be by Democritus are included in a chapter⁶¹ which is attributed to Zoroaster? Pliny in some way provides the context for these attributions, when, in *Naturalis historia* XXX 8–10 (cf. B 300.13 = 0.6.9), he gives a place to Democritus in the sort of history of magic he offers, making him the continuator or disciple of people like Ostanes, Apollobeches and Dardanus and saying that the Abderite illustrated magic in the same way in which, at the same time, Hippocrates illustrated medicine!

In view of the evidence that much was attributed to Democritus that cannot have been his there is the question as to how Democritus was introduced as one of the originators of such literature. Is there some ancient author who has a particular responsibility for this operation? Of course the name of Bolus of Mendes makes it appearance with some frequency in this connection. The suspicion that he was mainly responsible for this fabrication about Democritus is not new. I found it expressed already at the end of the seventeenth century by Pierre Bayle in the article *Democrite* in his *Dictionnaire historique et critique* (see his notes (I) and (K), where much of the evidence is already collected, the article as a whole revealing remarkable scholarship). Nietzsche provided substantial development to this hypothesis. In his *Nachgelassene Aufzeichnungen*, cit., there is a section that is explicitly entitled 'Bolus and

⁵⁹ This was pointed out by Oder (1899).

⁶⁰ As pointed out by Oder (1893) 1–40.

⁶¹ That is ch. 12 of book I.

his fabrication⁶² ('Bolos und seine Fabrik', pp. 307ff., from Mp VIII 6), in addition to other notes devoted to this point (e.g. pp. 214–217, from P I 4). He there points out that Bolos was considered a Democritean and suggests that he was one of those pupils who would use the name of their teacher for their own writings (cf. p. 311). This hypothesis was further developed by Wellmann, who also collects all the material which in his view is to be attributed to Bolos.⁶³

Yet indications that Bolos gave a decisive impulse to the creation and diffusion of all this pseudo-epigraphic literature are not as strong as scholars often assume. What Columella says about him is that his works or commentaries (*commenta*) are published (*produuntur*) under the false name of Democritus (cf. *De re rustica* VII 5, 17 = B 300.3 = 0.8.24), not that he himself published them in this way.⁶⁴ In addition, it is attested that Bolos was a Democritean (see *Scholia in Nicandri Theriaca* 764a = B 300.4 = 0.8.25, and art. *Absinthe* in the *Ethnika* of Stephanus of Byzantium),⁶⁵ which tend to show that he regarded his writings as a continuation of Democritus' production, but are not sufficient to show that he published them under that name. Aulus Gellius, who deplores the way in which Pliny accepted as Democritean fables fabricated by malicious people, does not mention Bolos. Wellmann goes further than this and supposes that Democritus was Bolos' second name (as suggested by the article in the *Suda*, cf. B 300.1 = 0.8.23.1, usually corrected to 'Democritean' in accordance with the other evidence) and that he exploited this to deceive people. Yet this is at least doubtful, and even if it were right, one would have to wonder how he could be so easily successful in his deception.⁶⁶ In fact one would still have to explain his influence. For instance, one would have to explain his

⁶² In fact the German 'Fabrik' used by Nietzsche, which could be rendered by 'factory', has the more neutral sense of enterprise, but the supposition is that it was an enterprise for the production of forgeries.

⁶³ See Wellmann (1928) and (1921).

⁶⁴ For the evidence we have about Bolos and for some reservations about his influence see the article *Bolos de Mendès* by Jean Letrouit in *Dictionnaire des Philosophes Antiques* ed. by R. Goulet, vol. II, Paris 1994, 133–134, where however the passage just quoted of Columella is mistranslated.

⁶⁵ Quoted by Letrouit in art. cit. (in n. 64).

⁶⁶ Kroll (1934) 228–232, objects to Wellmann that a double name was unusual in the Hellenistic period and that it was not reasonable for him to keep his name 'Bolos' if he wanted to deceive. He also points out that Wellmann goes too far, on the basis of the evidence we have, in ascribing all forgeries to him and in finding forgeries in cases in which reasons for excluding the authorship of Democritus are not strong.

influence on Pliny, when this author makes no reference to him and does not even quote him as one of his sources in his lists of them in book I of his work (where Democritus is mentioned very frequently and Thrasyllus, as we shall see, a few times). We cannot regard this author as wholly uncritical in his use of sources, for, when talking of the alleged contributions of Democritus to magic, he admits that there were those who protested they could not be his, adding however that they did so *frustra* (cf. *Naturalis historia* XXX 10 = B 300.13 = 0.6.9).

Probably more than one person played a role in this operation, and the question that has to be raised is whether Thrasyllus was one of them. If it could be shown that the final list of books attributed to Democritus which is quoted by Diogenes Laertius after the catalogue of those which are ordered in tetralogies goes back to him, there would be an indication that he has a responsibility in this matter, for, as we have seen, the titles are given without reservations about their authenticity. One could even suspect some astuteness in the way in which this list is given, for, to the remark that the books listed have contents that are significantly different from the rest of the Democritean production, the following reply could be given: 'Yes, this is true, but this is because they derive from the unpublished notes by Democritus, not because they are not authentic.' However, as we have seen above (sect. 7), it is impossible to establish whether the source of this list is Thrasyllus or somebody else.

Even if we exclude this reason for suspecting Thrasyllus, there remain two other reasons for doing so. One of them is rather weak. This is that according to one source (Ps.-Plutarch, *De fluviis* 11 [= T 11a Tarrant]) he comes from Mende and according to another source (Porphyry, *Vita Plotini* 20 and 21 [= T 19a and 19b Tarrant]) he was a Pythagorean and not only a Platonist. Both are points of contact with Bolus, who is also said (in the *Suda*) to be a Pythagorean. The other reason has more weight. This is that the name of Thrasyllus is present in the list of the sources given by Pliny for books II, IX, XXXI, XXXII of his *Naturalis historia* (in the list for book XXXI his name immediately follows that of Democritus), and in the case of the last two books he must have been the source of some of the fables that are told in them. This is certain in the case of book XXXII, for one of the fables told there is actually said to go back to Thrasyllus ('Thrasyllus auctor est nihil aeque adversari serpentibus quam cancos', cf. 19, 55 [= T10a Tarrant]). The fable is told shortly after a similar fable attributed to Democritus (cf. 18, 49). In any case, if Thrasyllus was ready to tell such

fables himself, it is difficult to suppose that he was not equally ready to attribute them to Democritus. Pliny is more likely to have relied on his authority than on that of Bolus of Mende. A close connection between Democritus and Pythagoras is assumed by him in various passages (e.g. book XXIV, 99, 102, 156, and book XXV, 13) and, though Bolus could also have suggested it, Thrasyllus is more likely to be responsible for it.

There is thus some evidence against Thrasyllus, even if not in an extensive form. At this point one is induced to ask whether there are reasons to suspect the authenticity of some of the titles included in his catalogue. In the case of the titles [XIII.3 and 4] *Tactics* (Τακτικόν) and *Fighting in Armour* it was already pointed out by Nietzsche (in *Nachgelassene Aufzeichnungen*, cit., p. 328, from Mp VIII 6) that a work on tactics (Τακτικά) in two books is ascribed to a 'Damocritus historikos' in the *Suda s.v.* (the same is then pointed out by Wellmann, *Nachträge* [to the third ed. of Diels/Kranz], p. xv, without reference to Nietzsche). Since the topic of fighting in armour is likely to constitute the second part of a work on tactics, it is also likely that the two titles in question are attributed to Democritus by mistake. There is no indication at all, in the testimonies we possess, that he had some interest in this sort of topic.

Another work which is open to suspicion is the first in the list, i.e. the *Pythagoras*. That this title is not likely to correspond to an authentic work by Democritus was already suggested by Nietzsche (in *Nachgelassene Aufzeichnungen*, cit., p. 164, from P I 4), then by Paul Natorp, in his *Die Ethika des Demokritos*, though he expresses confidence in this matter that is excessive.⁶⁷ That its authenticity is very questionable ('sehr fraglich') was also asserted by Zeller (cf. *Philosophie der Griechen*, I 2, p. 1047, n.). Nietzsche supposes (ibid., p. 487, from P I 7 [= *Écrits*, cit., p. 797]) that Thrasyllus was not aware that the writing is a fabrication and regarded it as genuine; again, so much confidence in this matter is excessive.

One may wonder what contents the *Pythagoras* ascribed to Democritus could have had. The suggestion that it contained a life of Pythagoras is not likely in view of the fact that there is absolutely no reference to a work of this type among the authors who showed some interest in Pythagoras and in Pythagoreanism. In particular Porphyry, in his *Life of*

⁶⁷ Cf. Natorp (1893) 3, n. 2, where he states: 'Nach §38 [*scil.* of book IX in Diogenes Laertius] *ohne Zweifel* pythagoreische Fälschung, welche bezweckte zu beweisen, dass Demokritos Nachfolger des Pythagoras sei' [my italics].

Pythagoras, quotes his sources with a certain frequency, but none of them is represented by a work attributed to Democritus. There is the supposition advanced by Nietzsche that the title *On the Disposition of the Wise Man* is an alternative title to *Pythagoras*, but this was already excluded above (sect. 4).

It seems to me more likely that the work was a collection of ethical sentences, so that its collocation among the ethical works would be fully justified. In the *Florilegia* and similar collections we possess there are a certain number of sentences attributed both to Democritus and to some Pythagorean. (This is true for instance of sentences 12, 23, 24, 90, 98, 115, 117, 126, 193, collected in the *Gnomologium Byzantinum*, in Wachsmuth's edition.) It may also be significant that a work entitled Περὶ εὐθυμίας is attributed to a Pythagorean named Hipparchus (cf. Stobaeus IV 44, 81 = 68 C 7). Certain tenets of Democritean ethics were acceptable in a Pythagorean tradition, just as they were acceptable in a Platonic tradition. It is true, on the other hand, that the sentences in question are not usually attributed to Pythagoras himself but to some Pythagorean like Sextus.⁶⁸ However probably a Pythagorean like Sextus was seen not as the inventor of the sentences but as their collector, it being assumed that the sentences in fact went back to Pythagoras or at least reflected Pythagorean wisdom. It is thus conceivable that Democritus himself was seen as the collector of sentences which were not invented by him but went back to Pythagoras. It would not have been difficult to put together a collection of Democritean sentences that could be regarded as reflecting Pythagorean wisdom and which could be presented (by means of some short introduction attributed to Democritus himself) as going back to Pythagoras. The title *Pythagoras*, accompanied by some explanatory subtitle, could have been given to the collection. (The sentences, in addition to being supposed to reflect Pythagorean wisdom, could have been chosen to give importance to the topic of wisdom, so that it would be easy to establish some continuity with the subsequent title *On the Disposition of the Wise Man*.)

This operation, if it took place and was due to Thrasyllus himself, certainly shows a defect in scholarly attitude but not necessarily bad faith. This author could have been sincerely convinced that all Dem-

⁶⁸ But in one MS at least a whole collection is presented as the 'Sayings of Pythagoras', cf. *The Sentences of Sextus* by H. Chadwick, Cambridge 1959, 84; the sentence 117 in this collection coincides with sentence 24 in the *Gnom. Byz.* and appears as sentence 395 with the lemma 'Of Democritus' in the *Flor. Marc.*

ocritean wisdom (as he asserted according to Diogenes Laertius IX 38) came from Pythagoras and thus may have regarded his own intervention as just making explicit what were Democritus' own intentions.

9. *On the works entitled Counsels (Υποθήκαι) and On contentment (Περί εὐθυμίας) and on the shape of Democritus' contributions to ethics*

Dionysius of Alexandria, quoted (or paraphrased) by Eusebius of Caesarea in his *Praeparatio evangelica* XIV 27, 5 (= B 119 = 0.5.5), refers to a work entitled *Counsels* which he manifestly takes as having been written by Democritus ('At the beginning of his *Counsels* he [*scil.* Democritus] says ...'), and quotes a passage. This Democritean passage must be genuine, since it coincides to some extent with one of the ethical fragments which appears under Democritus' name in Stobaeus' collection (it is II 8, 16 = B 119 = 147.1). A work with this title however does not appear in the catalogue of Democritean works reproduced by Diogenes Laertius. How is it related to the works whose titles are given in that catalogue?

The title given to the work and the coincidence between the passage quoted by Dionysius and the one quoted by Stobaeus suggests that it consists of a collection of ethical sentences. They are, typically, sentences of a prescriptive character, which suggest some rules of life or encourage the adoption of some kind of ethical conduct. Sentences of this sort are attributed to the Seven Sages (see e.g. the reference to an ὑποθήκη by Bias, Aristotle, *Rhetorics* II 13, 1389b23) and are to be found collected in Hesiod's *Works and Days* and in the poetic collection which circulated under Theognis' name (cf. Paul Friedländer, 'Hypothekai', pp. 558–616). There is some plausibility in the suggestion made by Philippson ('Demokrits Sittensprüche', p. 378) that the three ethical passages quoted by Clement of Alexandria (i.e. B 31–33 DK [= 136.1, 93.2.2, 171.1.1]) all come from the same work, since these Christian authors seem to make use of the same sources (as is shown by the parallel between the testimony of Clement and that of Eusebius in the case considered above of the alleged recourse to Babylonian wisdom). It is true however that Clement seems also to take into account the work 'On the (final) end', that is to say, presumably, the Περὶ εὐθυμίας (cf. B 4 [= 132.1]). But in this other case the testimony must depend on some general work of ethical doxography and not on a collection of sentences attributed to Democritus (no sentence is quoted in that pas-

sage and Democritus' view of the end is classified among a number of positions on this topic).

Some scholars are inclined to think that Ὑποθήκαι is another title for one of the works mentioned in the catalogue (this is Friedländer's position), while others (including Philippson) think it is more likely that the work is a collection of sentences put together by someone else after Democritus. Choosing one or other of these alternatives makes some difference, since in the first case it would be more likely that Democritus himself put together a collection of sentences and thus that the sentences we have are not the result of somebody's intervention which consisted in extracting from and reducing to sentences a discourse which could be continuous. Yet, apart from the issue as to whether Democritus is or is not the author of this particular collection, it remains likely that his contribution to ethics partly consisted of more or less short maxims. In the case of 'Democrates' *Golden Sayings*' it is clear that we are faced with a collection of short sentences. But a number of scholars are rather suspicious about this collection, and one reason for their reserve is precisely the shortness of these passages. If, for the moment, we limit our attention to the collection in Stobaeus, it cannot be denied that it includes a number of short sentences (especially those which coincide with those of the other collection, but there are others as well, e.g. B 180 [= 171.2], B 196 [= 166.3], B 198 [= 142.2], B 209 [= 143.4], B 210 [= 140.2], B 211 [= 140.1], B 218 [= 146.8], B 220 [= 146.9], B 224 [= 144.2], B 231 [= 144.6], B 232 [= 140.3], B 233 [= 140.4], B 268 [= 166.4], B 269 [= 147.3], B 288 [= 166.1], B 291 [= 146.6], and the whole series about 'fools', III 4, 71 ff. [= B 197 ff. = 138.3–5 and 151.1–5], i.e. a significant portion of the available passages). Dismissing them is somewhat more difficult.

This difficulty is increased if one does not start with prejudice in favour of the longer sentences and takes into serious consideration Laue's suggestion (1921, 32 ff.) that a number of longer sentences in Stobaeus' collection are the result of the combination of what originally were short sentences.⁶⁹ Examples of 'combined sentences' of this type (with the second sentence connected with the first by the insertion of

⁶⁹ Notoriously Laue's main point, in his dissertation, is that all the sentences in the Democrates collection and all the sentences in Stobaeus that either coincide with them or are similar to them do not belong to Democritus but precisely to a person called Democrates. The reasons he offers for this general conclusion were criticised, I think in a decisive way, by Philippson in art. cit. But Philippson himself thinks that Laue is right on this more specific point, cf. 381.

a particle like γάρ) are the following: B 173 (= 145.2), B 183 (= 171.3), B 187 (= 134.3), B 214 (= 143.2), B 219 (= 146.1), B 244 (= 159.2), B 246 (= 143.3), B 247 (= 138.12), B 283 (= 146.2), B 284 (= 146.3), B 295 (= 183.2); to these one can add sentences 19 (= 68 B 53 = 163.4) and 19a (= 68 B 53a = 163.5) in the Democrates collection. A confirmation of this hypothesis is given by the fact (also pointed out by Laue) that some of the simple sentences in these collections appear in other collections, such as the *Gnomologium Byzantinum*, in combination with another sentence (this is true of B 185 [= 171.5], and of Democrates 63 [= B 97 = 179.3]). Furthermore, and conversely, in one case a combined sentence appears in the same collection by Stobaeus as two distinct sentences (cf. B 214 [= 143.2]; the distinct sentences are St. III 17, 39 and III 6, 26 [= B 211]), in another case the first part of a combined sentence recurs by itself in Stobaeus' collection (cf. B 173 [= 145.2]), in a third case the second part of a combined sentence recurs in the Democrates collection (cf. B 187 [= 134.3], the coincidence being with sentence 2 [= B 36]), and both parts appear separately in still other collections (*Gnomologium Byzantinum* and *Corpus Parisinum Profanum*); in a fourth case (B 284 [= 146.3]) the second sentence is preceded by the lemma 'Of Democritus' in two MSS, and it is missing in a third MS, while, in the same MS, the first sentence is associated with the previous sentence in Stobaeus.

Faced with this evidence it is not easy to maintain that the short sentences in these collections, when genuine, are always the result of some manipulation of passages of some length (this of course is not to exclude that in some cases the manipulation has taken place). Other reasons have been adduced by scholars, of a lexical and of a stylistic type.⁷⁰ I cannot enter into a discussion that would have to be long-winded, and I limit myself to stating my position on this matter in a rather dogmatic way. From a lexical point of view it is true to say that the short sentences, and in a particular way the sentences belonging to the Democrates collection, do not reflect the inventiveness in peculiar words and expressions (those which pass as Democritus' *glossai*) which can be noticed in some of the long passages in Stobaeus.

⁷⁰ Note that Kahn (1985) 1–31, adduces reasons of this sort for his questioning the authenticity of the short sentences, and especially of those belonging to the Democrates collection, though sometimes he cannot help using them in his discussion. Similarly, Taylor (1999) excludes from his collection of *Fragments* all the Democrates sayings, including those which appear in Stobaeus, though admitting that 'their ultimate source is the writings of Democritus' (p. 226), and quoting them in translation in an appendix.

This is likely to reflect some adaptation (which is evident also in the frequent abandonment of the original Ionic dialect), which can be explained by the fact that a collection like the *Hypothekai* (whether or not originally prepared by Democritus himself) was meant to remain useful in offering prescriptions for life, and this required that it be written in a language that would be easily understood by their readers at the time it was circulated (centuries after Democritus). Some stylistic manipulation is likely to take place as well in such a process of adaptation, but to a lesser extent, for often the change of the words would be sufficient to ensure easy intelligibility. In fact I think that in various cases even the sentences of the Democrates collection betray Democritus' own style, once it is recognised that short sentences often cannot be stylistically identical to long passages (cf. sentences 6, 19, 23, 25, 26, 28, 30, 33, 36, 37, 45, 54, 56, 57, 60, 67, 72, 75).⁷¹

The short sentences are meant to be complete in themselves, being succinct and epigrammatic. It is to be expected that they offer either synthetic observations about life or prescriptions (and prescriptions can be short, as the obvious example of the Ten Commandments shows). They have to leave out any developed argumentation, and for this reason they are stylistically different from those passages which contain such argumentation. There is no reason to regard the longer passages as paradigmatic and the short ones as the result of a reduction of the former. In most cases such a reduction would have required a reformulation of the bits extrapolated from the long passages, in order to make them self-sufficient and provide them with the punch required of an efficacious short gnomic sentence. It does not seem very likely that such an extensive process of rewriting took place in the case of a significant part of Democritus' contributions to ethics. He had reasons to write short sentences: a tradition was already established in his time of providing short sentences (in addition to the cases mentioned above there are the sentences by Heraclitus that are sometimes short), and doing so responded to the requirement of giving suggestions that could be easily memorised in a period in which the transmission of culture remained to a large extent oral.

⁷¹ To my knowledge the best discussion of Democritus' style remains that by Theodor Birt, which is printed as an appendix (*Anhang*) to Natorp's *Ethika des Demokritos*. This author finds no reasons for excluding the short sentences in general or those belonging to the Democrates collection in particular.

A further question is whether these short sentences would stand alone or would follow one another so as to form what Laue calls a chain (*catena*) (1921, 36ff.). It would seem that he must be right in supposing that, at least in some cases, the passages formed a sequence. At least the series of sentences about 'fools' must have constituted such a sequence. (There is the difficulty, though, that 'fools' in some cases is ἀξύνετοι [in Democrates, not in Stobaeus], in others ἀνοήμονες, and in one case ἄνθρωποι.) It is also manifest that some sentences are close to each other because they deal with the same topic. Whether however this can be generalised remains an open question. It is not to be excluded that there was more than one collection, of sentences grouped in 'chains' in one case, and of isolated sentences in the other case. But it is not to be excluded either that in the same collection there were sentences of both sorts.

The beginning of the Ὑποθήκαι gives rise to a puzzle. According to Dionysius, as quoted by Eusebius, it consists of the following passage: '(1) Men have made the image of chance an excuse for their own lack of intelligence. (2) Fortune and sense (γνώμη) are natural opponents; (3) and it is this, the bitterest enemy of sagacity, which they say has the power. (4) Or rather, by raising fortune aloft and obscuring sagacity, they have substituted the one for the other. (5) For they do not praise sagacity as fortunate, but fortune as supremely sagacious.' (I adopt J.F. Procopé's translation in his unpublished Cambridge dissertation *Democritus the moralist and his contemporaries*; both the first and the third sentence can be translated in a somewhat different way, but this does not matter for the overall interpretation given here.) There is a partial coincidence between this passage and the next one in Stobaeus' collection (II 8, 16 = B 119 = 147.1): '(1) Men have made the image of chance an excuse for their want of counsel. (2) For chance rarely fights with intelligence. (3) Most things in life are kept on course by sharp sight and a good understanding.' (Given again in Procopé's translation. The exact rendition of the adjective βαυά in sentence (2) is problematic, but again this does not matter here.) Most scholars seem to think, following Diels and Kranz, that the real beginning of the Ὑποθήκαι is constituted by the Stobaeus passage, and that the Dionysius passage is a free reformulation of the same with some additional comments by him.⁷² Even if we accept this hypothesis, the beginning of

⁷² The passage is, for example, omitted in J. Barnes' collection of selected passages

the work seems to be constituted by a longish (though not very long) passage and not by a gnomic sentence. But is the passage a genuine unity? The Epicurean *sententia* 16 which is quoted by Diels and Kranz in the same connection clearly is a reformulation of the *second* part of the Stobaeus passage: 'Fortune hits the sage weakly: the things that are greatest and of utmost importance reason (λογισμός) has ordained and throughout the whole time of his life does and will ordain.' This evident affinity between the two passages suggests that the second part of the Stobaeus passage could stand by itself. The whole is another instance of a combined maxim obtained by the insertion of a γάρ.

At this point, however, we can go beyond this conclusion and admit that the difference between the Stobaeus and Dionysius passages is to be explained by the fact that Democritus could (and would) use either the same short sentences or short sentences with some slight variation to obtain different chains of sentences to be placed either in different parts of the same work or in different works. After all, Lucretius' procedure in his *De rerum natura* is not much different. In Democritus himself there are sentences which are slight variations of one another. This applies to some of the 'fools' sentences, and also to the two passages about hope (Stobaeus IV 46, 18 [= Democrates 23a] + 19 [= B 59 and B 292 = 138.10 and 11]), to the passages about 'doing many things' (cf. 68 B 3 and B 80 [= 152.1–5]) and to those about feeling shame before oneself (cf. B 84, B 244, B 264 [= 159.1–3]). It applies of course if our documentation is reliable. But one reason for questioning the reliability of part of our documentation has been precisely the existence of these variants, for scholars tend to assume that they are due to the intervention of later hands. The short pieces especially tend to be regarded as the result of a reduction of longer ones. Yet there are no clear signs that this is what has taken place.

Coming back, now, to the two passages under discussion, if one starts by considering the Dionysius passage by itself, one cannot find reasons, in the context, for supposing that the genuine quotation is restricted to (1) (in the subdivisions adopted by me), followed by (2) to be taken as the result of a deformation of (2) in the Stobaeus passage. In the Dionysius passage (2) leads to (3), and both to the rest of the passage, while the corresponding bit in the Stobaeus passage is not suited to lead to such a development, while it is suited to lead to (3) in *that* passage.

in translation entitled *Early Greek Philosophy*, Harmondsworth 1987, cfr. 257 and 266, and quoted with reservations by Löbl (1989) 85, and Taylor (1999) D 29, 15.

It is sufficiently clear that the purpose of the whole development after (1) is to clarify how men are induced to use the image they have of chance as an ‘excuse for their own lack of intelligence’: confronted with chance (τύχη) and sense (γνώμη) as opponents, they make chance great and sense small, and attribute to the former qualities (especially sagacity) which belong to the latter. The whole passage illustrates very well what Dionysius takes as being Democritus’ attitude to chance: in spite of his having recourse to it in explaining large physical processes, ‘he banished it from human life, refuting (ἐλέγχων) the stupidity of those who honour it’. That there is an error in people’s hypostatizing chance is in fact better explained in the Dionysius passage than in the Stobaeus passage. The latter makes a related (and of course important) point, namely that in reality chance is weak and intelligence strong, so that (it is implied) one should become conscious of the fact that this really is so. The two passages are in fact clearly complementary, not one a corruption of the other.

It can be added, against any attempt to reduce the extension of the quotation by Dionysius, that there is a change in argument in the paragraph after it, so that the whole passage was clearly meant to be a quotation from Democritus. Furthermore, the sort of word-play which is to be found at its end, i.e. in (5), seems to be rather typical of the style adopted by Democritus, though it is true that Dionysius is quite able to use similar word-plays (he accuses the Abderite of thinking that ‘the greatest wisdom (σοφία) resides in the apprehension of foolish [literally: ‘wisdomless’: ἀσόφως] and senseless occurrences’). Finally, the Dionysius passage seems to be less easily divisible into short sentences than the Stobaeus passage. This is one reason why, on the whole, it seems likely that a collection of Democritean ‘counsels’ such as the one to which reference is made by Dionysius did not include short sentences only, but a combination of short and less short ones, like the collections of sentences by Epicurus. (The hypothesis that Epicurus, who must himself be the originator at least of the collection of the *Capital Doctrines* [Κύρια δόξαι], took as his model a collection of Democritean sentences, which sometimes are echoed in some of his own sentences, was advanced by more than one scholar.⁷³ However I think that Epicurus was also motivated by his own concern to epitomise his own doctrines, doing this more or less synthetically, in this case with

⁷³ Cf. e.g. von der Mühl (1919) 172–178.

the maximum of synthesis, for he is not just offering ethical counsel, as Democritus was, but summarising his whole philosophy. Hence very short sentences are rather an exception in that collection, which offers only a partial term of comparison with a collection of Democritean sentences.)⁷⁴

Coming back to the issue of the collocation of the Ὑποθήκαι, it is in fact not even sure that Dionysius had in mind a work with that title rather than simply referring to a work containing 'counsels' by Democritus. Certainly it is not easy to find a title, in the catalogue, which can be seen as fully corresponding to this title, if it is one.⁷⁵ A miscellaneous collection like *Amalteia's Horn* is probably to be excluded as not being prevalently ethical (see above). One cannot exclude, on the other hand, that *Tritogeneia* included a collection of this sort, in which case however no trace is left of the apparent division in three parts which it should have involved (see above). There is some difficulty in admitting that the Ὑπομνήματα ἠθικά corresponds to the Ὑποθήκαι, since this title suggests, rather, 'notations', 'remarks' ... ('Aufzeichnungen': Mansfeld, 'Aide-mémoire': Brunschwig), but no doubt there is no neat distinction that can be drawn between the two genres of collection.

If these two titles, even if probably not by Democritus himself, somehow reflected his intentions, one could think of two different collections of sentences, some being mainly of a prescriptive character (the ὕποθή-και), giving suggestions on how to live, and the others being mainly of a descriptive character, in that they provide a presentation of the human condition in general. However, though it is possible to draw some distinctions among the fragments we have according to whether they are mainly prescriptive (e.g. in inviting to moderate one's wishes) or mainly descriptive (e.g. in describing men as overcome by excessive wishes and fears), there are no indications that the passages were meant to be kept separate in this way. For instance the description of men being overcome by an excessive fear of death implies the 'counsel' that one should conquer this kind of fear.

It would seem, on the whole, that the only distinction which can be drawn with sufficient plausibility is that between short (i.e. very short and relatively short) sentences which can be associated with titles like Ὑποθήκαι (if it is a title), Ὑπομνήματα ἠθικά and *Tritogeneia*, and

⁷⁴ On the nature of this Epicurean 'catechism' cf. Clay (1983) 72–81.

⁷⁵ It is easy to notice the difficulties which Friedlaender (1913) meets in making this attempt, cf 616.

longer sentences, which can be associated (in some cases with great probability) with the title *Περὶ εὐθυμίας*. It does not seem that we have any basis for drawing further distinctions. And it has to be wondered whether the three titles now mentioned, and possibly some other titles as well (including *Pythagoras*, on which see above), are not alternative titles for one main collection of sentences, which was originally put together by Democritus himself and which could have undergone some changes by the hands of others (as is easy with this sort of sentence).

Concerning, now, the title *Περὶ εὐθυμίας*, it is plausible to connect it with those passages in which the motif of contentment is introduced in an explicit way (and not just in passing). This is true, in the first place, of the longest fragment we have, Stobaeus, III 1, 210 (= B 191 = 171.1). It is equally true of the (relatively long) fragment in Stobaeus concerning the avoidance of doing many things (*πολλὰ πράσσειν*) (IV 39, 25 [= B 3 = 152.1]). There is a third main passage, a shorter one, in which the motif is introduced, namely one concerned with the attitude one should have about pleasure (cf. Stobaeus III 1, 47 [= B 189 = 139.1]). It cannot be doubted that it is of relevance to what was said in the work on the topic of contentment. The same is not true of a fourth passage, of some length, in which its mention is not quite relevant to what is stated there, so that doubts have been expressed by scholars as to whether the formulation as it stands is due to Democritus himself (cf. Stobaeus II 9, 3 [= B 174 = 157.8]). A fifth passage which introduces this motif concerns the distribution of one's possessions to one's children and, though it sounds like a counsel, may have belonged to the work in question (cf. Stobaeus IV 26, 25 [= 279 = 182.4]). Rather close to this passage are other passages concerning the relationship fathers should have with their children (cf. Stobaeus IV 24, 29; IV 29, 31; IV 24, 32; IV 24, 33; IV 26, 26 [= B 275, 276, 277, 278, 280 = 181.1, 181.2, 182.1, 182.2, 172.1]), so it is possible that they also belonged to this work. The topic of contentment (*εὐθυμία*) also makes its appearance in a short sentence (cf. Stobaeus IV 39, 17 [= B 286 = 144.5]) but, though it cannot be excluded that they are a reduction of passages of some length, it is easily conceivable that they belonged from the start to a collection of short sentences, for there is no reason why Democritus should have restricted its introduction to a work with that title.

Furthermore, I am inclined to think that what is attested by Plutarch concerning Democritus, not only for the motif that the soul is the internal source of both goodness and evil but also for the motif that, in a trial between the soul itself and the body, the former would have

to be convicted because of the greater responsibility even for the evils concerning the body (cf. B 159 and B 149 [= 135.1, 2 and 3]), goes back to the *Peri euthumias*, since the motif of contentment (εὐθυμία) is actually introduced in one of these passages (cf. *Animine an corporis affectiones sint peiores* 1, 500C9 [= 135.3, om. DK]) and since the doxography (especially by Arius Dydimus, cf. A 167 = 131 [longer quotation]) also insists on the fact that happiness for Democritus lies in the soul.⁷⁶

Even if one accepts that all the passages mentioned above, with one or two possible exceptions, belonged to the *Περὶ εὐθυμίας*, it is impossible, on the basis of their contents, to reconstruct the general trend of this work. A more precise indication is given by the testimony of Seneca (unfortunately not beyond suspicion, since it involves a correction of the text) that Democritus started his work *On Tranquillity of the Soul* with the precept that one should avoid doing many things in order to achieve this tranquillity (cf. *De tranquillitate animi* 13, 1 = n. ad 68 B 3 = 152.3). If this is in fact what Seneca intends to suggest, and his testimony is reliable, it can be conjectured that, since Democritus could not just start with such a dry precept but had to give some substance to it, he went on to give a description of the condition of those people who actually do many things. (This description is in fact given by Seneca, not in this work, but *De ira* III 6, 3, 5–6; 7.2 [= n. ad 68 B 3 = 152.4], with explicit reference to this assertion by Democritus.) One can equally expect that, after this description, he said something about the opposite condition which leads to contentment. In this connection he will have pointed out that the main source of goodness and of evil for men is their soul, and that they are mistaken in attributing the cause of their troubles to external factors such as chance. The condition of contentment (and thus of happiness) depends on us and not on external circumstances, and it involves being satisfied with what one has by avoiding a troublesome search for more, eliminating envy towards those who actually do have more than we, and so forth.

Beyond these very general suggestions it is difficult to go. It is tempting to suppose that the two main surviving works *On Tranquillity of the Soul*, by Plutarch and Seneca, followed a model that in the end goes back to Democritus' work. Yet this supposition, at least in some version of it, meets difficulties. In general it is believed by scholars that Plutarch did not have Democritus' own work in front of him, but one that was

⁷⁶ Siefert (1928) 26–28, offers these and some further reasons for supposing that Plutarch depends on that source.

inspired by it, namely the work with the same title by Panaetius.⁷⁷ The evidence for this is not as strong as one would wish. There is just one testimony that Panaetius was the author of a work entitled *Περὶ εὐθυμίας*, namely Diogenes Laertius IX 20 (= fr. 45 Van Straaten = 86 Alesse). Cicero, who has much to say about Panaetius' work *Περὶ τοῦ κατ'ἥκοντος* and about his ethics in general, is silent about this other work. In Diogenes the work is mentioned in an anecdote about Xenophanes: he is said to have buried his sons with his own hands like Anaxagoras. Demetrius of Phalerum, in his work *On Old Age*, is given as a source for this information along with Panaetius the Stoic in his book *Περὶ εὐθυμίας*. The same anecdote is told by Diogenes directly of Anaxagoras in the chapter on Anaxagoras, and there only the work by Demetrius is adduced as a source (cf. II 13). One may wonder whether Diogenes, who quotes with some frequency Panaetius as a source of his information about philosophers and, in one case, with explicit reference to his work *On Philosophical Schools* (*Περὶ αἰδέσεων*) (cf. II 87), is not the victim of error, though admittedly it is not clear what sort of error this could have been.

Even if we exclude this possibility, the evidence about Plutarch's having made use of Panaetius' work is not strong, beginning with the fact that he makes no explicit reference to it. What induced scholars like Siefert to believe that Plutarch was familiar with it is his statement, *De cohibenda ira* 16, 463D, that, 'as Panaetius said somewhere, we should make use of the precept of Anaxagoras', that is to say, do as he did when, at the death of his son, he said: 'I knew that I had begotten a mortal'. Plutarch also refers to Anaxagoras' precept in his *Περὶ εὐθυμίας* 16, 474D, a passage which is clearly parallel to the passage in the other work (as illustrated in a persuasive way by Siefert 1908, 62). His source for the precept of Anaxagoras, then, may still be Panaetius, and if this can be identified as his *Περὶ εὐθυμίας*, he will have had this work in front of him.

One problem with this reconstruction is the vagueness with which Plutarch recalls the testimony of Panaetius ('he said *somewhere*'). If he had the work in front of him, rather than quoting from memory or from his own notes, it would have been more obvious to give its title. Another problem is the supposition of a link between the anecdote about Anaxagoras burying his sons with his own hands and the asser-

⁷⁷ This view, already put forward by Hirzel (1879) 354–407, esp. 379, was developed by Siefert (1908), esp. 39ff. and 61ff.

tion that he knew he had begotten mortals. (Note that the plural, not the singular, as in Plutarch, is used, but the change in this case is not difficult.) The trouble here is that Diogenes Laertius, in his chapter on Anaxagoras, just before telling this anecdote, mentions this assertion as well (with the reservation, not relevant here, that it was also attributed to other people), but without establishing any connection between the two, since in this case he adduces as his source not Demetrius of Phalerum but Satyros, and draws a connection between the loss of the sons and the accusation of impiety at Athens (cf. II 12–13).

It has to be concluded that the evidence for Plutarch's use of Panaetius' *Περὶ εὐθυμίας* when writing his own work with the same title and drawing his information about Democritus' work from Panaetius is weak. It also seems improbable, on the other hand, that Plutarch had the work by Democritus before him. The way in which, at the beginning of chapter 2 of his work (cf. B 3 and, for a longer quotation, 152.2 in my collection) he censures the person (not named) whose advice is not to do many things if one wishes to reach contentment, by accusing him of encouraging inactivity, thus idleness and softness, and even the betrayal of friends and family and country, cannot be at all fair to Democritus, and is also in contrast with his mention of him, in polemics with the Epicureans, for his positive evaluation of taking up political commitments (cf. *Adv. Col.* 32 = B 157 = 153.1). This was noticed by various scholars, including Siefert (1928, 9–10), and this time I am inclined to follow his suggestion that Plutarch, in his strongly polemical attitude, really had in mind the Epicureans and not Democritus. However, whether he had some good reasons for being polemical with regard to them (since they exploited Democritus' precept to their own ends)⁷⁸ or whether he is the victim of an oversight, the fact that he does not warn the reader in any way that this is his real target and not Democritus, with whom the formula was usually associated (as all the other testimonies show), is evidence of a carelessness that would be unlikely if he had Democritus' work before him. (It can be suspected that this is one of the books he consulted in a library on the occasion of one of his travels, but that, when writing his own books, he based himself on his notes and memory, with a resulting lack of precision.)

⁷⁸ This is a suggestion by Siefert that receives some confirmation from the appearance of that precept in Diogenes of Oenoanda, fr. 113 Smith [40 Ch.] = B 3, n. = 152.5.2, with a likely connection with fr. 113 Smith [41 Ch.].

It remains true, of course, that Plutarch must have had some model to follow in his work, for he cannot have believed that the title adopted by him, and the topic dealt with in it, was a new one, but must have had some awareness of the fact that Democritus was the author of a *Περί εὐθυμίας* (this awareness is explicit in Seneca, whose sources of information were probably not very different from those of Plutarch). But we need not suppose he had the whole work by Democritus before him: excerpts from it and some indirect information must have been available to him, just as (probably in a more reduced form) to us.

DEMOCRITUS AND LUCRETIUS ON DEATH AND DYING

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In this paper I shall compare the views of death and of the process of dying attributed to Democritus by various ancient sources with those found in Lucretius, especially in Book III of *De Rerum Natura*. Though this topic has recently been the subject of an excellent study by James Warren,¹ his sagacious treatment still seems to me to leave some issues open for discussion. In particular, I shall suggest that the differences between our two authors on death and dying arise naturally from their differing conceptions of the nature of the soul.

Democritus conceives of the soul as a simple psycho-physical structure, a web of spherical and hence highly mobile atoms permeating the entire structure of the body. The most explicit evidence is that of Lucretius himself, who reports (in order to reject) Democritus' view that there are exactly as many soul-atoms as body-atoms, arranged alternately (III 370–374)² (i.e. presumably that between any two body-atoms there is a soul-atom and vice versa). Democritus appears to have ascribed the principal functions of the soul, viz. thought, perception or sensation (*aisthesis*) and the initiation of motion to this structure as a whole (Aristot. *De an.* 404a27–31, 405a8–13 [68 A 101]). The weight of the evidence points to his having made no distinction of parts of the soul, and specifically to his not having distinguished the mind or rational (part of the) soul from the non-rational (part or parts of the) soul. There is indeed a conflict of evidence on this point, since two passages of ps-Plutarch's *Epitome* (Aet. IV 4, 6; IV.5,1 [68 A 105]) report that he distinguished the intellect from the non-rational soul and located it in a particular part of the body. But the two passages are mutually inconsistent, the former locating the intellect in the chest (i.e. the Epicurean view, see below) the latter (followed by Theodoret. *Cur.* V 22) in the head or more specifically the brain (the Platonic view, *Tim.* 70 A–

¹ Warren (2002). For a fuller treatment of Epicurean attitudes to death see Warren (2004).

² Subsequent references to Lucretius are to Book III unless otherwise specified.

B). It is clear that whoever compiled the epitome was not working from an original text, but merely assumed that Democritus' view must have been identical with one or other of the currently most influential views. On the other side we have the explicit testimony of Philoponus, Themistius and Tertullian [68 A 105] that Democritus made no distinction between the intellect and the rest of the soul, of Sextus (supported by Lucretius, *loc. cit.*) that he held that thought occurs throughout the whole body (*Adv. math.* VII 349 [68 A 107]) and of Aristotle (*loc. cit.*) that he identified mind and soul. The weight of the evidence is clearly in favour of the latter view.

The whole animal is then a psycho-physical mechanism, in which the psychically active element, the soul, permeates the whole, in a way similar to that in which electric charge permeates the charged body. There is no indication of a central locus or nucleus of psychic energy controlling or integrating psychic activity, in such a way that peripheral activity depends on central functioning. Soul-atoms (or more strictly clusters of soul-atoms) are adapted to cause bodily motion and to respond to external activity (i.e. to perceive or to think) wherever they are in the body, and the animal is psychically active, i.e. alive, so long as it contains enough soul-atoms to preserve psychic function throughout the whole body or substantial portions of it.

Since death is the cessation of psychic functioning, consequent on the loss of a number of soul-atoms *sufficient* to sustain that functioning, this view of the soul naturally leads to a view of the distinction between life and death as a continuum, rather than as a sharp cut-off. If a person has lost so many soul-atoms that thought, sight, hearing, smell, taste and bodily functions such as respiration and voluntary movement have all ceased, yet a few soul-atoms remain at the periphery, e.g. in the fingers and toes, there is no theoretical reason for Democritus to deny that sensation might occur in those parts. Sensation does not, as we have seen, require the transmission of information to any central sensorium. And we have doxographical evidence that Democritus actually held exactly that view. The most explicit evidence is from ps-Plutarch (*Aet.* IV 4, 7 [68 A 117]):

‘Democritus says that everything contains a sort of soul, including corpses, which is why it is always apparent that they have a sort of warmth and perception, though most of it is breathed out.’

This is indeed the source whose evidence we judged unsatisfactory on the distinction of the intellect from the non-rational soul, and were

it unsupported it would be rash to rely on it. But it is supported by Cicero, who reports (*Tusc.* I 34, 82 [68 A 160]) that Epicurus criticised Democritus for maintaining that sensation can persist after death, by Alexander (*Tóp.* 21.21 [68 A 117]) and by Proclus (*Resp.* II 113, 6 [68 B 1]) and Tertullian (*De an.* 51, 2 [68 A 160]), who indicate that Democritus cited instances of apparently dead people coming back to life (such as Er in Plato, *Resp.* X), explaining these by the theory that a 'spark of life' (i.e. some soul-atoms) remains in the corpse, and (according to Tertullian) supporting this by appeal to the (supposed) phenomenon of the continued growth of hair and nails after death.³

As Warren points out,⁴ the theory that even minimal perception might persist after death was anathema to orthodox Epicureans, since their central doctrine that 'Death is nothing to us' rests on the premisses that death is the dissolution of the soul-body complex, that sensation ceases when the complex is dissolved and that what is without sensation is of no concern to us (*KD* 2). One strategy for reconciling Epicurean orthodoxy with the phenomena adduced by Democritus is that of defining death as the total *and irrevocable* cessation of all vital functioning,⁵ from which it would follow that in cases such as that of Er where a 'spark of life' is assumed to remain in the body, the person is not actually dead. The passage of Cicero cited above suggests that the 'followers of Democritus' ('Democritii', whoever they were) may have made that move in response to Epicurus' criticism; Democritus does not say (they may be supposed to have replied) that sensation persists after death, but rather than in some cases where death is supposed to have occurred it has not actually occurred. But that strategy threatens the consolatory power of the mantra 'Death is nothing to us', which assumes a fairly clear criterion for determining when death has occurred. If, for all we know, the objects we commonly regard as corpses have some minimal

³ Warren (2002) cites physiological evidence pointing out that this supposed phenomenon is a misinterpretation of the effect of the shrinking and desiccation of the skin after death (198 n. 19).

⁴ (2002) 199–200.

⁵ Modern authorities unanimously define death as the irreversible cessation of vital functioning. For an example see the model code proposed by the U.S. President's Commission for Study of Ethical Problems in Medicine and Biomedical and Behavioural Research (Washington, D.C., 1981). This contains the following statement of criteria of death: 'An individual who has sustained either (1) irreversible cessation of circulatory and respiratory function or (2) irreversible cessation of all functions of the entire brain, including the brainstem, is dead. A determination of death must be made in accordance with accepted medical standards.' (Cited in Zaner (1988) vii.)

sensation, then even the staunchest Epicurean has grounds for being concerned about what happens to them, thus re-opening the way for the fears about the treatment of one's corpse which Lucretius is at such pains to dispel (870–893).⁶ An alternative strategy would simply be to deny the occurrence of the phenomena which Democritus appealed to. That, however, looks suspiciously like dogmatism, especially in view of the fact that the Epicureans themselves had grounds to make use of similar phenomena (see the evidence from Lucretius cited below). A sounder strategy would be to adduce theoretical grounds for the impossibility of the occurrence of sensation in isolation from the activity of the integrated psycho-physical complex; if that strategy were successful the phenomena apparently pointing to the occurrence of sensation in that situation would have to be interpreted in some other way. I shall now suggest that in Book III Lucretius provides evidence that the Epicureans in fact took that latter route.

A central element in this strategy is the distinction of the mind, located in the chest, from the rest of the soul, scattered throughout the body. Though this distinction is not explicit in what we possess of Epicurus' own texts, it is confirmed by a scholiast on *Ep. ad Her.* 67 (Usener 311, Long/Sedley 141), by Aet. IV 4, 6 (cited above) and most fully by Lucretius' distinction of the *animus*, located in the chest, from the *anima* pervading the body. The *animus* is the mind (94–95), which Lucretius identifies with the seat of the emotions (141–142). He stresses the fact that together with the *anima* it forms a unified system in which the *animus* has a controlling function (94–95, 136–139); the rest of the soul 'obeys and is moved according to the direction and impulse of the mind' (*numen mentis momenque*, 143–144). The example given in this passage is the effect of emotion on the body as a whole, e.g. sweating, pallor and fainting brought on by fear; the fearful stimulus is registered in the *animus* and its effects are transmitted throughout the organism by the *anima* (153–160). Again, the *animus* is the source of bodily movement, its directions being transmitted to the limbs via the *anima* (161–164). Here the *anima* is functioning as the nervous system, transmitting information and impulses from the central *animus* to the periphery of the embodied organism.

The crucial question for our enquiry is whether sensation too requires the activity of the unified *animus-anima* system, or whether it is

⁶ See Warren (2004) 20–23.

a function of the *anima* alone. Here Lucretius' account of the micro-structure of the soul is relevant. Again in opposition to Democritus, who held that all the soul-atoms were of the same kind, viz. very small and spherical, and hence fiery (Aristot. *De an.* 403b31–404a9 [67 A 28]), Lucretius constructs the soul of atoms of different kinds, atoms of heat, air, wind (231–236) and a fourth type, distinguished from the others by being smaller and yet more mobile (241–244), which is said to be the source, not only of motion for the other soul-atoms (247–248), but of sensation throughout the body (245, 272). This type of atom lies deep within the body (273–274), and is described as 'the soul of the soul' (*anima animae*, 275, 280–281) which 'controls the whole body' (*dominatur corpore toto*, 281). It is, then, the vital principle of the soul itself, the source of activity, including sensation, throughout the whole psychic structure. It does not appear to be identical with the *animus*, which also includes component atoms of the other three types (288–293). Rather it seems to be seen as the active principle of the mind itself, as it were the motor of all psychic activity, including thought and sensation.

It appears from this that while the activity of the *anima* is necessary for sensation (e.g. feeling a pain in one's foot requires the stimulation of *anima*-atoms situated in the foot) it is not sufficient by itself, since the activity of the *anima* itself presupposes the activity of this vital central element of the mind and thereby of the whole psychic system. The mind, or more strictly this elusive vital element within the mind, may be seen as a centre of consciousness, unifying and giving mental reality to the activity of the *anima* throughout the body. Lucretius emphasises the centrality of the mind at 396–400:

'for without the mind (*mens*) and the *animus* no part of the soul (*anima*) can remain in the limbs for a tiny moment of time, but it accompanies it readily and scatters into the air.'

This passage picks up another key theme, that of the instability of the soul. Since the soul is composed as a whole of highly mobile atoms and since the atoms of the vital centre, the 'soul of the soul' are the most mobile of all, that element of the soul is conceived as something like a highly volatile gas, instantly dissipated as soon as its bodily container is shattered (425–444).

Given that sensation requires the central organising activity of the *animus*, and that the latter is dissipated instantly as soon as its bodily container suffers sufficiently significant damage, the Epicureans then have good ground for denying that sensation can continue after such

damage, and hence that it can continue after death. But at the same time they emphasise certain phenomena which point to activity of the *anima* independent of the *animus*. In principle, such phenomena ought to be able to occur after the dissipation of the *animus* into the air. And that possibility might appear once again to open the way for the Democritean suggestion that sensation might occur in the 'inanimate' (i.e. *animus*-less) corpse.

One of Lucretius' main premisses in his arguments for the mortality of the soul is the thesis that the soul is not a unitary substance, but a whole composed of parts. Since anything composed of parts is liable to destruction through the progressive loss of parts, the soul, being such a composite, is destructible in that way. Hence his emphasis on cases where psychic activity ceases in parts of the body while continuing in others, e.g. when paralysis creeps up (as in Plato's description of the death of Socrates in the *Phaedo*) from the extremities to the centre (526–532). Lucretius' explanation is that the *anima*-atoms in the limbs are dispersed, while those in the rest of the body remain active. Another phenomenon supporting the particulate theory of the *anima*, which is more immediately relevant to our topic, is the continued activity of severed bodily parts. Lucretius gives gruesome descriptions of the twitching of severed limbs, of a severed head preserving its living expression and open eyes 'until it has yielded up all the traces of the soul' and of the discrete parts of a chopped-up snake writhing and attacking each other (634–663). Here again, the point is to demonstrate that the 'force of the soul' (*vis animai*) is physically dispersed by the process of physical dissection, and hence that the soul must be mortal (638–641). Here the *anima* continues to perform at least one vital function, the causation of movement, for some time after the bodily parts concerned are physically cut off from contact with the organising and directing *animus*.⁷ Should we not then expect that the other main activity of the *anima*, sensation, would similarly continue for some time in separation from the *animus*? Yet this graphic passage mentions only the motion of the severed limbs and the life-like expression of the severed head. The only mention of sensation is the statement that, in the heat of battle, the man who loses a limb does not feel any pain, because the blow is so

⁷ Note the contrast with 398–399:

*nam sine mente animoque nequit residere per artus
temporis exiguum partem pars ulla animai.*

sudden and his mind is concentrating on the fight (645–647). Since the whole living person does not feel pain, it seems plausible that Lucretius' view is that the severed limb or head does not itself feel pain either, and this is confirmed by his explicit statement at II 910–914 that sensation is a function of the whole organism, which cannot occur in a separated part. The front part of the severed snake is indeed described as 'struck by the burning pain of the wound', but that presumably is the part which houses whatever centre of consciousness corresponds in the snake to the human *animus*. Lucretius thus differentiates sensation from the initiation of motion, in that whereas the latter function of the *anima* can persist after the severing of communication with the *animus*, the former cannot. It remains to investigate the grounds for that distinction.

As another proof of the particulateness, and therefore of the mortality of the soul, Lucretius cites the generation of maggots in decomposing corpses as evidence that 'seeds of the soul' (*semina animai*) remain scattered throughout the body (713–721). Since, like ancient theorists generally, Lucretius was ignorant of the true explanation of this phenomenon, his account is that some of the atoms of the dead body are recycled to form the bodies of the maggots. But since the latter are alive they must contain soul-atoms too, which must also have been recycled from those composing the corpse. Hence the corpse must contain soul-atoms as well as body-atoms. Now this is precisely the foundation of the Democritean view that the corpse retains some degree of sensation, and the phrase 'seeds of the soul' is reminiscent of the 'spark of life' (ἐμπύρευμα τῆς ζωῆς) in the Proclus passage cited above [68 B 1]. Yet the treatment of this residue of the soul by Lucretius is altogether different from that by Democritus. For the latter the residue is the physical basis of the continuation of some vital functioning of the 'dead' person, and it provides the potential in at least some cases, such as that of Plato's Er, for the complete recovery of function. For Lucretius the vital functioning of the person ceases with death; hence the subsequent activity of residual soul-atoms scattered throughout the body cannot continue the vital functioning *of the person*, in however attenuated a form. Rather it constitutes the vital functioning of those different creatures in whose bodies the soul-atoms have become incorporated, viz. the maggots. Once again, we have to ask what explains the difference between the two accounts.

What I take to be central to the Epicurean position (represented here by Lucretius) is the insight that what we may call the higher psychic functions, thought, perception/sensation and the initiation and control

of bodily motion, require the integration of incoming information and outgoing direction into a single, centrally-controlled system. This idea is not original to Epicureanism; we find the central idea in Plato's *Theaetetus*, in the denial that the separate senses are housed in the body like the warriors hidden inside the Trojan horse (184 D), and it is foreshadowed in Empedocles' theory of the blood round the heart as the organ of thought [31 B 105]. It seems, however, to be absent from the atomism of Democritus. On the question I have discussed in this paper, whether sensation can persist after the cessation of other aspects of life, it is the application of this picture to consciousness which is crucial. In the doctrine that it is the central *animus*, and more especially the elusive 'fourth nature' of the *animus* which accounts for the '*sensiferos motus*' of the soul I suggest that we find an anticipation of Descartes's doctrine that, unlike the body, the soul, whose only essential attribute is consciousness, is necessarily unitary (*Meditations* 6, Adam-Tannery VII 85–86). Descartes's point is that we are necessarily aware of all the different exercises of mental functioning, thought, will, perception etc. as functions of one and the same self. Though various abnormal phenomena, such as schizophrenia and split-brain phenomena,⁸ may cast doubt on the necessity of Descartes's thesis, it is clearly correct as an account of normal functioning, including that of consciousness. Though one feels bodily sensations in different parts of the body, not in the brain, it is the integrated person who feels them. I can indeed conceive of feeling pain in a severed hand, but were that to happen it would be I, this embodied person here, who felt the pain *in* the hand lying over there. Can we imagine *the hand itself* feeling pain? But then *whose* pain would the hand feel? Suppose it is my hand that has been cut off, but I feel no pain in the hand (though perhaps I feel it in the arm from which the hand has been severed).⁹ Then, if the hand itself feels pain, it is not my pain; nor, presumably, is it anyone else's pain. Then it would seem that the pain that the hand feels is simply the hand's pain, no-one else's. But now the hand is being treated as a centre of consciousness in its own right, as if, by being cut off, it has somehow become itself a sort of primitive person, or at least an animal.

⁸ See Nagel (1971), reprinted in Glover (1976) 111–126 and in Nagel (1979) 147–164; Glover (1988), chs 1–3.

⁹ Or perhaps I feel pain in the 'phantom hand'. I.e. it feels to me a) that my hand is still attached to my body; b) that I have pain in that hand. That is simply another way in which I feel pain; it is not a case of the hand's feeling pain.

It is surely clear that that is pure superstition; since an attached hand is not itself an animal, but part of an animal, how could severing it confer on it the extra capacities necessary for being an animal? While I am not suggesting that the Epicurean position somehow relies on this argument, I think it not unreasonable to claim for the Epicureans the fundamental insight which underlies it.

We can now see why the Epicureans might reasonably allow motion to persist in separated bodily parts, while denying that consciousness persists in them. While voluntary motion, like consciousness, is a function of the integrated animal, the twitching of a severed limb is not an instance of voluntary motion. Rather it is a purely mechanical effect of prior stimuli, persisting temporarily after the connection with the source of those stimuli has been cut, rather as a residual electric charge may persist briefly in a charged body (e.g. a radio receiver) after the current has been disconnected. So when the limb twitches the question 'Whose twitching is occurring?' does not arise; the twitching is not anyone's twitching, but merely the twitching *of the limb*. That is exactly the situation we saw to be impossible in the case of pain; since any pain must be felt by some sentient being, there can be no pain which is no-one's pain, but merely pain *in* a hand or leg. To repeat, the supposition that there is pain in a hand or leg detached from a functioning centre of consciousness is the supposition that the hand or leg has itself become just such a centre of consciousness in its own right, which is impossible.

The Epicurean account of the soul thus represents a major advance over that of Democritus, in its recognition that consciousness is the activity of an integrated psychical system, involving the integration of diverse sensory input and control of voluntary movement, which it is plausible to locate in some functionally central bodily part. Hence they were better able than Democritus to recognise that continued post-mortem activity of soul-atoms scattered throughout the body, which they and Democritus alike accepted, is not of itself a sufficient ground to postulate the occurrence of post-mortem sensation. In insisting on the central controlling function of the *animus*, and in particular on the necessity of that function for the functioning of the *anima* as a sensory system, they may reasonably be seen (allowing for their ignorance of anatomy and neurophysiology) as foreshadowing the modern scientific picture in which those functions are fulfilled by the brain. And in taking the dispersal of the *animus* as constituting death they can therefore be seen as foreshadowing the dominant modern conception of death as brain-death, the irreversible cessation of the functioning of

the brain. On that conception, whatever other vital functions, such as breathing or circulation, continue (normally with artificial help), a person whose brain has ceased permanently to function (e.g. because of brain damage) is dead, and conversely someone whose brain continues to function in the absence of other vital functions is alive.¹⁰ On these crucial points the Epicurean picture is in essential agreement with the modern. Where it differs (apart from the obvious anatomical disagreement on the location of the vital centre) is that the Epicureans assume that the dispersal of the *animus* is (virtually) instantaneous and irreversible, whereas modern science recognises that brain function may itself cease gradually rather than instantaneously, and that in certain circumstances, such as drug intoxication and hypothermia, where the brain itself has not undergone major trauma, even total cessation of brain function is not irreversible.¹¹ Modern science has therefore largely abandoned the idea of a moment of death,¹² which is central to the Epicurean picture, underlying its confidence that 'death is nothing to us'. And, ironically, though Democritus' failure to identify a controlling centre of psychic function makes his picture of the soul and its activity in general less satisfactory than the Epicurean, it made it easier for him to recognise a possibility which the theoretically more advanced Epicureans denied, but which modern science has shown actually to occur, viz. the return to life of someone who satisfies all the criteria, save that of irreversibility, of clinical death.¹³

¹⁰ The lively contemporary controversy on whether the crucial concept is the functioning of the whole brain, the 'higher brain' (including the cerebrum and cortex) or the brainstem is not relevant to the present discussion. See Zaner (1988); Lamb (1996), especially ch. 5.

¹¹ See e.g. Lamb (1996) 54: 'Certain drugs and low body temperature can place the neurons in 'suspended animation'. Under these conditions they may survive deprivation of oxygen or glucose for some time without sustaining irreversible damage.' Lamb cites a report from *The Lancet* of 6 March 1976 (p. 535), describing a drug-intoxicated patient who, 12 hours after losing consciousness, showed no spontaneous respiration and a total absence of all sensory responses and brainstem reflexes, but who had almost totally recovered within 72 hours. For these reasons the standard guidelines for the identification of death in the U.K. and U.S.A. require the absence of drug intoxication, hypothermia and other factors which 'mimic' clinical death. See Plum (1999) 34–65.

¹² See e.g. Brody (1999) 79: 'the death of the organism is a process rather than an event'; Plum (1999) 53: 'Natural death is not an event. It is a process in which different organs or parts of organs permanently lose their life-supporting properties at widely varying times and rates.' For a defence of the traditional concept of a moment of death see Lamb (1996), ch. 7.

¹³ I am indebted to my colleague Dr. D.S. Fairweather for advice on medical questions relating to this paper.

DEMOCRITUS ON SOCIAL AND PSYCHOLOGICAL HARM¹

JAMES WARREN

I

There are many difficulties to be faced when thinking about the philosophy of Democritus of Abdera. One of the most perplexing is the question of the presence or absence of any systematic interconnection between the many and various philosophical positions he advocated. There is no doubt that he was a prolific writer and someone interested in a vast range of different questions, ranging from metaphysics through cosmology to ethics, politics, and aesthetics. But did he set out his thoughts on all of these questions in what we might call a system, a consistent and mutually supporting set of philosophical views in different areas of thought? Was he concerned to offer an integrated and consistent view of all of these different areas of human inquiry? It is difficult to be sure, not only because of the poor state of much of the surviving evidence about his thought in a large number of these areas, but also—and perhaps more importantly—because it is not clear whether we should expect such a systematic overall approach. If, for example, we were reasonably confident that there was some such systematic approach then some of the gaps in our information could be compensated for and filled by extrapolation and informed speculation based on other, better known, areas.

¹ I would like to thank the organisers and participants in the Paris colloquium for their reactions to an earlier version of this paper.

It is true that many post-Hellenistic sources cast Democritus as a eudaimonist thinker who presented in familiar fashion a *telos* of life (e.g. Clem. Al. *Strom.* II 130; Diog. Laert. IX 45). I think there are good reasons to suspect that this is an anachronistic reading of Democritus. See Warren (2002) 19–23, 32–44 and cf. Kahn (1998) 34–37. Annas (2002), on the contrary, takes these indications, together with the thought that (171) ‘eudaimonism is the structure to be found in all Greek theories that make their structure explicit and is also the structure to be found in the ethics of Plato and the Platonic Socrates, where it is not made the subject of discussion but is nonetheless explicit’ to count strongly in favour of presuming a eudaimonist framework for Democritus also.

One might take the view that at least within some general areas of philosophical thought, Democritus did take a systematic line. It seems clear that, despite various particular difficulties of reconstruction or interpretation, Democritus' physics and epistemology were intended to form a coherent body of thought. But what about his ethical and political thought? Should we expect a similar approach there? It is not immediately evident that we should expect a systematic approach to ethics at all, let alone an approach which conforms in general terms to the 'eudaimonistic' form of ethical theory familiar from Aristotle and the Hellenistic period. It is certainly possible to begin with the view that Democritus merely produced a number of ethical thoughts without a view to producing an ethical system.

Perhaps the most significant question of systematisation poses itself when we consider the relationship between different areas of philosophical inquiry. Should we assume or expect that Democritus was concerned to ensure a close relationship—or even any relationship at all—between his physical and cosmological theories and his ethical and political thoughts? This question is particularly urgent for us, I suppose, since it puts pressure on the most general problem of our information about Democritus. The vast majority of secondary reports from antiquity focus on Democritus' atomist physics and its accompanying metaphysics and epistemology. And, indeed, it is as an atomist natural philosopher that Democritus is now best known. But the majority of what we may with reasonable confidence call first-hand pronouncements by Democritus which survive are concerned not with atomism but with ethical and political issues. This peculiar situation generates severe difficulties for any attempt to marry these two major areas of Democritus' philosophical output. In the absence of any clear presumption in favour of positing a close systematic link between atomist physics and Democritus' ethics, we are left in a difficult situation. Although there have been attempts to argue for more or less significant links between physics and ethics in Democritus' thought, my impression is that at present a general air of scepticism hangs over at least the more ambitious of such attempts.² In part, this may be because it is not

² This 'link' could be as strong as the derivation of major ethical conclusions from physical theses or a weaker set of connections such that only certain ethical views (e.g. about the non-existence of an afterlife) are derived from certain physical theses. For a provocative attempt to describe a physical basis for Democritean ethics see Vlastos (1945–1946) and compare the approach of Farrar (1988); but note also the scepticism

even clear whether an interpretative principle of charity would favour presuming a connection between ethics and physics in order to offer to Democritus a coherent body of thought or would, in fact, favour rejecting any such connection on the grounds that, philosophically speaking, such a connection is *prima facie* absurd.³ In any case, if any systematic link had been proposed by Democritus then it seems that, as a result of the transmission—or rather failure of transmission—of much of the material, we are no longer in a position to demonstrate it. Someone might argue that, moreover, there is little lost in passing over this question since, this same someone might claim, there is little of any major philosophical significance to be found in the Democritean ethical pronouncements. It is much better, therefore, to leave them alone and concentrate on the more interesting physical and metaphysical areas of Democritus' thought.

We should not endorse any view which advocates simply the neglect of Democritus' ethical thought, and I have attempted elsewhere to show how the evidence, such that it is, can be marshalled to provide relatively firm ground for various conclusions about Democritus' conception of an individual's well being and therefore for attributing to Democritus a coherent overall ethical position on this subject.⁴ Here, however, I want to turn to look at some other elements of Democritus' ethical thought to offer an example of one method of approaching the various global interpretative difficulties I have just outlined. Concentrating on a number of his pronouncements about how we should manage and avoid criminal and other harmful acts, we can ask whether Democritus can be offered a coherent and consistent account of the effects of crime and other forms of harm and their social and political importance. Only by attempting to deal piece by piece with the evidence we have will we be able to offer more general conclusions about Democritus' approach to ethical and political thought. Second, this topic suggests in turn a tantalising clue to a possible interconnection

of Taylor (1967) (qualified a little in Taylor (1999) 232–234), and Barnes (1982) 530–534.

³ Cf. Barnes (1982) 534, who rejects the possibility of any derivation of ethics from physics: 'Democritus' practical philosophy has no metaphysical or physical basis. Nor should we really expect it to have. For what, after all, would a physical basis for ethics look like? Ethics and physics, so far as I can see, have no systematic interconnexion at all; in many boring ways a man's natural philosophy will rub off on his moralizing, but no general or systematic influence is even conceivable.'

⁴ Warren (2002).

between Democritus' ethical and political thoughts and his physical views—in particular, his psychological theories and the famous doctrine of atomic emanations, or *eidola*. I conclude by offering some methodological remarks on the prospects for further work on the question of the interrelation between Democritean ethics and physics.

II

Let us begin by recalling of one particularly striking assertion to be found in the ethical fragments, concerning the treatment of what Democritus terms 'enemies' (πολέμοι). These are to be treated just as we treat wild beasts:

[68 B 259] (Stob. IV 2,17):

ὁκωσπερ περὶ κιναδέων τε καὶ ἐρπετέων γεγράφεται τῶν πολεμίων, οὕτω καὶ κατὰ ἀνθρώπων δοκεῖ μοι χρεῶν εἶναι ποιεῖν· κατὰ νόμους τοὺς πατρίους κτείνειν πολέμιον ἐν παντὶ κόσμῳ, ἐν ᾧ μὴ νόμος ἀπείργει· ἀπείργει δὲ ἱερὰ ἐκάστοισι ἐπιχώρια καὶ σπονδαὶ καὶ ὅρκοι.

Just as has been written in the case of enemies that are foxes and snakes, so—it seems to me—should we also act in the case of human enemies. Killing enemies is sanctioned by ancestral laws in every constitution in which the law does not forbid it. But in fact it is outlawed by local shrines⁵ in each state and treaties and oaths.

The previous two fragments in the Stobaeon collection fill in the reference at the beginning of this fragment by telling us just how we ought to treat potentially dangerous wild animals such as wolves or snakes. They are to be exterminated, and anyone who carries out this task is to be well rewarded:

[68 B 257] (Stob. IV 2,15):

κατὰ δὲ ζώων ἔστιν ὧν φόνου καὶ μὴ φόνου ὧδε ἔχει· τὰ ἀδικέοντα καὶ θέλοντα ἀδικεῖν ἀθώιος ὁ κτείνων, καὶ πρὸς εὐεστοῦν τοῦτο ἔρδειν μᾶλλον ἢ μὴ.

This is how it is concerning the murder (or not) of animals. He who kills those who cause injustice and are disposed to cause injustice should be without charge, and doing this contributes to well-being more than omitting to do it.

⁵ Or, perhaps, local religious rites and customs.

[68 B 258] (Stob. IV 2,16):

κτείνειν χρη̑ τὰ πημαίνοντα παρὰ δίκην πάντα περὶ παντός· καὶ ταῦτα ὁ ποίων εὐθυμίας καὶ δίκης καὶ θάρσεος καὶ κτήσεως ἐν παντὶ κόσμῳ μέζω μοῖραν μετέξει.

We should in all cases kill all those who cause injury unjustly. He who does this shall have in every state a greater share of happiness, justice, security and possessions.

There are a number of issues which could be drawn from these fragments.⁶ My interest, however, is on the light they shed on Democritus' conception of wrong-doing, its effects and its prevention. We first need to consider just how radical are the recommendations in [68 B 259]. In particular, it is important to ask whether Democritus endorses the provisions against the slaughter of enemies which he notes are currently imposed by various religious means (sanctuaries in which killing would be forbidden, treaties between states and oaths). I see no reason to assume that he would recognise the authority of such mechanisms unless they were to serve some more general social good, since there is little reason to think that Democritus conceived these religious sanctions as anything other than human constructions. Even if he is not an atheist in the mould of, say, Prodicus, his theology does not seem to offer much scope for specific divinely-instituted appropriate methods of worship.⁷ In that case, the second and third clauses in [68 B 259] are to be read as descriptions of what is currently the practice in Greek cities, not what would be the case were a city organised entirely according to Democritean principles. On the one hand, Democritus cites the presence of 'ancestral laws' as support for his recommendation while, on the other hand, noting that in practice these laws are trumped by various countervailing religious authorities.⁸ We may further suspect that Democritus would favour the abolition of any such authorities which prevented the beneficial extermination of social 'enemies' unless they perform in the process some greater beneficial role. Anyone who does act in order to benefit his society by exterminating these pests should

⁶ See Procopé (1989) 310–313 and (1990) 23–26 for a detailed discussion of the text of these fragments and an exploration of their place in Democritus' social and ethical thought. Also note the discussion in Farrar (1988) 248–252.

⁷ Of course, Democritus' views on the nature of the gods are the subject of some interpretative dispute. [68 B 30]'s reference to *λόγιοι ἄνθρωποι* might suggest a sarcastic tone, but see e.g. Montano (1984) 155–157 and compare Vlastos (1945–1946) 580 n. 24.

⁸ For a discussion of the ritual and religious aspects of pollution caused by killing see Parker (1983) 104–143.

be praised and rewarded, and should not be subject to any sort of prosecution (ἀθῶιος)—a message repeated in [68 B 260]:

[68 B 260] (Stob. IV 4, 18):

κιξάλλην καὶ ληιστὴν πάντα κτείνων τις ἀθῶιος ἂν εἴη καὶ αὐτοχειρίῃ καὶ κελεύων καὶ ψήφωι.

Anyone who kills a robber or pirate should be without charge, both if he does it by his own hand and also if he orders or votes for the action.

Here the responsibility for the action may reside not merely with the person who carries out the killing, but also with those who order or vote for it. However the killing is caused or legitimated, no one should be subject to prosecution for such an action.⁹ These are justifiable, indeed beneficial, killings.

The next pressing question is the identification of these enemies. Are they all members of opposing states or armies? Or does the class also include pirates, robbers and so on who are not members of any citizen army but are nevertheless a threat to one's own and one's fellow citizens' lives and property? (This class of person might reasonably be likened to wolves or snakes preying on those at the margins of the community.) Or can they also be members of one's own community who threaten it through some other kind of wrong-doing? It is difficult to be sure, but whoever these people are, Democritus is recommending swift and harsh treatment. Importantly, if we understand him to be recommending the exact same treatment for these human 'enemies' as for dangerous wild animals, this treatment is to be visited not only on those who have already caused some wrong, but also on those who are of the sort to commit some such wrong, regardless—we may presume—of whether in fact any such wrong has yet been committed. The mere attempt at wrongdoing, or the tendency or intention to do wrong, is sufficient to warrant a severe penalty ([68 B 257]: τὰ ἀδικέοντα καὶ θέλοντα ἀδικεῖν). The analogy with wild animals is telling. Just as no one would wait until a predatory fox had indeed killed one of his flock before taking the appropriate action, so no one should wait until harm has been done by some malefactor before removing

⁹ For discussions of Athenian laws and attitudes concerning homicide see MacDowell (1963) and Carawan (1998). Democritus would not have been addressing a solely Athenian audience and would be aware of many other local legal and religious systems concerning homicide. We lack the evidence necessary to construct the background for Abderan law and practice.

the possibility of harm being done at all. Indeed, failing to take the appropriate action is to be censured. The phrasing and vocabulary of [68 B 257] emphasises the strong parallel which Democritus wishes to draw between the current treatment of non-human animals and the similar treatment he recommends for dangerous humans. It announces at the outset that it is a prescription about ζῷα—a term perhaps most naturally interpreted as referring to non-human animals—but proceeds to use the language of justice and injustice—language more usually applied to relationships between humans. Either, Democritus implies, humans who commit injustices are to be understood as one of the species of ‘animals’ which this fragment discusses or non-human animals are just as capable of acts of ‘injustice’ as humans. Either way, there is no morally significant distinction to be drawn between the behaviour of human and non-human animals and they should therefore be treated similarly.

We are now in a position to draw some general conclusions about Democritus’ philosophy of punishment and his overall criminology. In part, he recommends a robustly forward-looking consequentialist attitude to punishment based on the benefits of preventing further injustice and damage. These ‘enemies’ and potential enemies are, ideally, to be prevented from causing any harm in the first place and, failing that, to be prevented from causing any further damage once their harmful tendencies are manifest. Action should ideally be pre-emptive and decisive, hence the striking analogy of potential wrong-doers and predatory or poisonous wild beasts. Such people should simply be exterminated. But Democritus also appears to recognise a retributive, backward-looking, role for punishment in redressing injuries already sustained. In other pronouncements, he insists that criminals are to be resolutely condemned and those who suffer wrongs are to be requited.¹⁰ Further, he is adamant that omitting to punish the wicked or recompense the wronged is itself wrong.¹¹

¹⁰ See [68 B 261] (Stob. IV 5, 43): ἀδικουμένοις τιμωρεῖν κατὰ δύναμιν χρὴ καὶ μὴ παριέναι· τὸ μὲν γὰρ τοιοῦτον δίκαιον καὶ ἀγαθόν, τὸ δὲ μὴ τοιοῦτον ἀδικον καὶ κακόν. τιμωρεῖν here is surely stronger than ‘assist’ as Taylor insists.

¹¹ [68 B 262] (Stob. IV 5, 44): καὶ οἱ φυγῆς ἄξια ἔρδουσιν ἢ δεσμῶν, ἢ θωῆς ἄξιοι, καταψηφιστέον καὶ μὴ ἀπολύειν· ὅς δ’ ἂν παρὰ νόμον ἀπολύῃ κέρδει ὀρίζων ἢ ἡδονῇ, ἀδικεῖ, καὶ οἱ τοῦτο ἐγκάρδιον ἀνάγκη εἶναι. Cf. Procopé (1989) 317–318. For more general discussions of Greek penology see Mackenzie (1981), Allen (2000).

III

A strong and sure attitude is recommended both for those who directly administer a punishment and for those who sanction it. No one should flinch from these decisions, since the welfare of the citizens both individually and collectively is at stake. 'Welfare' here should not be narrowly understood as covering merely physical and material goods. A number of fragments also assert the important link between the psychological welfare of individuals and the good of the city at large. Civil strife is caused by envy, that is a particular state of mind of some person or group of persons, and the damage it causes harms everyone, the victors and the vanquished alike. It is therefore right that laws should curb individuals' abilities to live as they please. Such laws benefit everyone, provided they submit to their rule.¹² Conversely, the absence of strife, like-mindedness among citizens, provides the ideal context for collective and individual well being.

[68 B 245] (Stob. III 38, 53):

οὐκ ἂν ἐκώλυον οἱ νόμοι ζῆν ἕκαστον κατ' ἰδίην ἐξουσίην, εἰ μὴ ἕτερος ἕτερον ἐλυμαίνετο· φθόνος γὰρ στάσις ἀρχὴν ἀπεργάζεται.

The laws would not prevent individuals from living just as they please if each did not harm the other. For envy causes the beginning of civil strife.

[68 B 249] (Stob. IV 1, 34):

στάσις ἐμφύλιος ἐς ἑκάτερα κακόν· καὶ γὰρ νικέουσι καὶ ἡσσωμένοις. ὁμοίη φθορή.

Strife within a community is a harm to both sides. There is similar destruction for both the winners and losers.

[68 B 250] (Stob. IV 1, 40):¹³

ἀπὸ ὁμοιοῦς τὰ μεγάλα ἔργα καὶ ταῖς πόλεσι τοὺς πολέμους δυνατόν κατεργάζεσθαι, ἄλλως δ' οὐ.

From like-mindedness alone come great achievements and the ability for cities to conquer their enemies.

¹² Cf. [68 B 248] (Stob. IV 1, 33): ὁ νόμος βούλεται μὲν εὐεργετεῖν βίον ἀνθρώπων· δύναται δέ, ὅταν αὐτοὶ βούλωνται πάσχειν εὖ· τοῖσι γὰρ πειθομένοισι τὴν ἰδίην ἀρετὴν ἐνδείκνυται.

¹³ Cf. [68 B 186] (Stob. II 33, 9).

These statements reinforce the picture which emerged from the consideration of Democritus' often severe sanctions against wrong-doers. For Democritus, the state of mind of the agent is ethically important both for that individual and for those around him, not because Democritus wishes to insist on some independent moral value which should be attributed to the possession of 'good will' of some sort, but rather because of the respective consequences of those intentions on the agent and those around him. Other commentators have noticed the perhaps surprising prominence in the Democritean *moralia* of discussions of individual 'conscience', of how an individual may be tormented internally by failing properly to internalise a 'law' of good and right conduct. [68 B 191], for example, the longest of the ethical fragments, concludes with a reference to the absence of envy, jealousy and ill-will (φθόρος, ζήλος, δυσμενία) from the well-balanced and *euthymos* life. (The envious man pains himself as much as an enemy in the 'Democrates' fragment [68 B 88].) States of mind, particularly emotions like envy which are directed towards others, seem not only to be able to make an active contribution to the welfare or otherwise of an individual but also—perhaps more interestingly—of the community at large, and in both cases laws stand as guides to proper positive behaviour and shame and punishments are inflicted for 'unlawful' conduct. In short, competitive or malevolent intentions can foster discord and harm just as cooperative and positive intentions can benefit and improve both the individual and the city. Laws and punishments are the prime methods of instilling and internalising the correct beneficial attitudes.¹⁴

The overall conception which emerges from Democritus' statements about social harm, justice, and the pre-emptive removal of potential offenders is clear enough and has been well explored by others. He offers a positive exhortation to just conduct both for the sake of the individual and his own well-being and also for the promotion of general social harmony and well-being which in turn provides a beneficial context for the individual's life. This is combined with corresponding attitudes to the psychological harm to the individual himself of incorrect conduct and also the social damage that such wrong-doing creates. Thus he justifies the swift and unflagging condemnation, punishment, and—at the extreme—execution of wrong-doers and potential wrong-doers.

¹⁴ See [68 B 174, 179, 244, 248, 256, 261, 264]. For discussion see especially Procopé (1989) and (1990) and also Farrar (1988).

However, there is some reason to think that this overall picture of the impact of intentional states was complemented by a Democritean conception of the nature and mechanism of psychological harm such that there was available to him a physical explanation of the damage done to individuals and the society at large not only by the ‘material’ harm done by brigands, corrupt officials, criminals and so on, but also by the very presence of harmful intentions, fear, resentment, envy and so on which these people promote. At least, there is some good evidence for positing a genuine Democritean physical mechanism for explaining interpersonal psychological benefit and harm.

The following intriguing passage occurs within Plutarch’s description of a conversation about the phenomenon of the ‘evil eye’ (τὸ κατα-βασκαίνειν, βασκανία) in *Quaest. conv.* p. 681 A ff [68 A 77]. As they describe the phenomenon, all the participants agree that it must require some sort of emanation theory of vision in which our organs are stimulated by effluences and also some notion of the interaction between body and soul such that intentions and thoughts can produce bodily effects. Once again, envy (φθόνος) is agreed to be a particularly influential state of mind, easily transmitted and extremely damaging (681 D). At the end of this conversation, Gaius reminds the others of Democritus’ views (*Quaest. conv.* V 7, 6 p. 682 F – 68 A 77):¹⁵

ἐμοῦ δὲ πανσαμένου, Γάιος ὁ Φλώρου γαμβρός· τῶν δὲ Δημοκρίτου, ἔφη, εἰδώλων, ὥσπερ Αἰγέων ἢ Μεγαρέων, ἀριθμὸς οὐδείς οὐδὲ λόγος· ἅ φησιν ἐκείνος ἐξέειναι τοὺς φθονοῦντας, οὗτ’ αἰσθήσεως ἅμοιρα παντάπασιν οὐθ’ ὀσμῆς ἀνάπλεά τε τῆς ἀπὸ τῶν προΐεμένων μοχθηρίας καὶ βασκανίας, μεθ’ ἧς ἐμπλασσόμενα καὶ παραμένοντα καὶ συνοικοῦντα τοῖς βασκαينوμένοις ἐπιταράττειν καὶ κακοῦν αὐτῶν τό τε σῶμα καὶ τὴν διάνοιαν· οὕτω γὰρ οἶμαι πως τὸν ἄνδρα τῇ δόξει, τῇ δὲ λέξει δαιμονίως λέγειν καὶ μεγαλο-πρεπῶς.

When I had stopped, Gaius, Florus’ nephew, said, “Is there no mention nor discussion of Democritus’ *eidola*? Is he to be left out ‘like the Aigeans or Megareans’?”¹⁶ Democritus says that envious people emit these *eidola*, which are not entirely without a share in perception nor impulse¹⁷ and

¹⁵ On Plutarch and the evil eye see Dickie (1991). There may be another use of Democritean emanation theory in Apollonius’ description of Medea’s use of the ‘evil eye’. See Powers (2002).

¹⁶ This is a reference to a proverb. These two states received an oracle telling them they were going to be passed over. Cf. *Paroem. graec.* 1 p. 19.

¹⁷ The Loeb translation has here: ‘emitted not altogether unconsciously or unintentionally’. I think the point is, rather, that these *eidola* retain some imprint of the sender’s mental attitude and it is this which transmits envy, for example, to the recipient.

are full of their senders' bitterness and malevolence. Filled with this and preserving it they come into contact with those who are 'bewitched' and disturb and harm both their bodies and thoughts. That at least is what I think Democritus thinks, and it is what he says in marvellous and impressive language.¹⁷

This passage from *Quaest. conv.* has often been linked with another, at 734 F – 735 B (also [68 A 77]), in which Democritus is said to have accounted for divination in dreams by appealing to similar emanations conveying both physical appearance and mental content, perhaps also based on material from Democritus' work *Περὶ εἰδώλων ἢ Περὶ προνοίας* (Diog. Laert. IX 47).¹⁸ Both these passages are then often plausibly used to construct a Democritean account of the origin of theological beliefs, and it is sometimes thought that these *eidola* may, in fact, have been identified by Democritus as gods.¹⁹ There are many difficulties in the precise interpretation of this view since it is not clear, for example, whether by saying that these *eidola* possess 'perception and impulse' Democritus means that they are autonomous perceiving and thinking beings. A more conservative interpretation would hold only that, as

¹⁸ Plutarch. *Quaest. conv.* VIII 10, 2 p. 734F–735B: ὁ δὲ Φαβωρίνος αὐτὸς τὰ μὲν ἄλλα δαμονιώτατος Ἀριστοτέλους ἑραστής ἐστι καὶ τῷ Περιπάτῳ νέμει μερίδα τι πιθανοῦ πλείστην· τότε μέντοι λόγον τινὰ τοῦ Δημοκρίτου παλαιὸν ὥσπερ ἐκ καπνοῦ καθελὼν ἡμαυρομένον οἷος ἦν ἐκκαθαίρειν καὶ διαλαμπρύνειν, ὑποθέμενος τοῦτο δὴ τοῦτιδῆμιον ὁ φησι Δημοκρίτος ἐγκαταβυσοῦσθαι τὰ εἰδῶλα διὰ τῶν πόρων εἰς τὰ σώματα καὶ ποιεῖν τὰς κατὰ ὕπνον ὄψεις επαναφερόμενα· φοιτᾶν δὲ ταῦτα πανταχόθεν ἀπύοντα καὶ σκευῶν καὶ ἱματίων καὶ φυτῶν, μάλιστα δὲ ζώων ὑπὸ σάλου πολλοῦ καὶ θερμότητος οὐ μόνον ἔχοντα μορφοειδεῖς τοῦ σώματος ἐκμεμαγμένας ὁμοιότητας (ὡς Ἐπίκουρος οἶεται μέχρι τοῦτου Δημοκρίτῳ συνεπόμενος, ἐνταῦθα δὲ προλιπὼν τὸν λόγον), ἀλλὰ καὶ τῶν κατὰ ψυχὴν κινήματων καὶ βουλευμάτων ἐκάστωι καὶ ἡθῶν καὶ παθῶν ἐμφάσεις ἀναλαμβάνοντα συνεφέλεσθαι καὶ προσπίπτοντα μετὰ τούτων ὥσπερ ἔμψυχα φράζειν καὶ διαγγέλλειν τοῖς ὑποδεχομένοις τὰς τῶν μεθιέντων αὐτὰ δόξας καὶ διαλογισμοὺς καὶ ὀρμάς, ὅταν ἐνάρθρουν καὶ ἀσυγχύτους φυλάττοντα προσμίξει τὰς εἰκόνας. τοῦτο δὲ μάλιστα ποιεῖ δι' ἄερος λείου τῆς φορᾶς αὐτοῖς γιγνομένης ἀκωλύτου καὶ ταχείας. ὁ δὲ φθινοπωρινός, ἐν ᾧ φυλλοχοεῖ τὰ δένδρα, πολλὴν ἀνωμαλίαν ἔχων καὶ τραχύτητα διαστρέφει καὶ παρατρέπει πολλὰ καὶ τὰ εἰδῶλα καὶ τὸ ἐναργὲς αὐτῶν ἐξίτηλον καὶ ἀσθενὲς ποιεῖ τῇ βραδυτῇ τῆς πορείας ἡμαυροῦμενον, ὥσπερ αὖ πάλιν πρὸς ὀργόντων καὶ διακαομένων ἐκθρῶσκοντα πολλὰ καὶ ταχὺ κομιζόμενα τὰς ἐμφάσεις νεαρὰς καὶ σημαντικὰς ἀποδίδωσιν.

¹⁹ Cf. [68 B 166] (Sext. Emp. *Adv. math.* IX 19), which similarly refers to beneficial or harmful *eidola*: εἰδῶλα τινὰ φησιν ἐμπελάζειν τοῖς ἀνθρώποις καὶ τούτων τὰ μὲν εἶναι ἀγαθοποιὰ τὰ δὲ κακοποιὰ· ἐνθεν καὶ εὖχετο εὐλόγων τυχεῖν εἰδώλων, εἶναι δὲ ταῦτα μέγιστα τε καὶ ὑπερφυῖ καὶ δύσφθαρτα μέν, οὐκ ἄφθαρτα δέ, προσημαίνειν τε τὰ μέλλοντα τοῖς ἀνθρώποις θεωρούμενα καὶ φωνὰς ἀφιέντα. ὅθεν τούτων αὐτῶν φαντασίαν λαβόντες οἱ παλαιοὶ ὑπενόησαν εἶναι θεόν, μηδενὸς ἄλλου παρὰ ταῦτα ὄντος θεοῦ τοῦ ἀφθαρτον φύσιν ἔχοντος. Compare: Plutarch. *De def. orac.* p. 419A and Themist. *De div. in som.* 43.1 (not in DK = Luria 472a).

Gaius' account suggests, they merely retain and preserve in their journey both the bodily and psychic imprint of the sender without being themselves sentient.²⁰ The evidence is unfortunately not univocal. At 735 B these *eidola* are said to convey mental content merely 'as if they were alive' (ὥσπερ ἔμψυχα) while, when answering Gaius, Plutarch at 682 B–C explains his omission of any reference to Democritus by saying that he wanted to avoid scaring his audience late at night with tales of ensouled and thinking *eidola*. Further, Gaius himself, in the passage cited above, claims that these *eidola* possess not only impulse but also perception (αἰσθησις), and it is not easy to see how this can mean anything other than that the *eidola* themselves perceive. It is at least conceivable that Democritus considered that these personal *eidola* contained sufficient soul atoms in the correct configuration that they were themselves sentient and this may well have played a role in his theological views.²¹ However, it is to my mind more plausible that this conception of 'ensouled' *eidola* is a misinterpretation—wilful or otherwise—of Democritus' view that the *eidola* which all persons emit retain an imprint of the psychic state of that person since, after all, Democritus did think that the soul atoms were present throughout a person's body, including at the surface of the skin: the very outer layers which are sloughed away as *eidola*.²² It is easy to see how various absurdities would arise if these *eidola* were indeed themselves all sentient since then my perception of any other person would be severely hampered by the possibility of the *eidola* taking on, literally, a life of their own as they

²⁰ Cf. Vlastos (1945–1946) 580 n. 24, who downplays the theist language in e.g. Sext. Emp. *Adv. math.* IX 19: 'To be sure, they are, in Sextus' language, "beneficial" or "harmful". But this refers to their specific physical effects on the organism, as in the case of the *eidola* whose bad effect is described by Plutarch.'

²¹ See the discussions in Montano (1984) 459–465, Morel (1996) 306–332 and Taylor (1999), esp. p. 214–215. However, it seems to me that Taylor is wrong to claim (p. 214) that 'Sextus' testimony of the prophetic activity of the *eidola* [i.e. Sext. Emp. *Adv. math.* IX 19] confirms that they act intentionally, which in turn confirms Plutarch's testimony of their beneficence or malevolence. (Prophecy is presumably an instance of beneficence, on the assumption that prophesies are normally intended to benefit those to whom they are given.) Sextus merely says that they 'foretell what is to come by appearing and speaking to humans' (προσημαίνειν τε τὰ μέλλοντα τοῖς ἀνθρώποις θεωρούμενα καὶ φωνὰς ἀφιέντα.), which leaves it entirely open whether the *eidola* themselves are doing so intentionally or not. προσημαίνειν can be used of medical symptoms or meteorological conditions giving forewarning of the future: see LSJ s.v.

²² Lucret. *De rer. nat.* III 370–373. Lucretius gives his reasons for dissenting from this view at III 374–395. For further discussion and comparison of Democritus' and Epicurus' conceptions of the structure and arrangement of the soul within the body see also Taylor (this volume).

travel from the perceived person to the perceiver. The Epicureans in particular seem to have been keen to promote the most extreme interpretation of these personal *eidola*, and it is presumably not coincidental that they also wished to dissent both from Democritus' view of the arrangement of soul atoms within the person and also, it seems, various other aspects of his theological doctrines.²³ Indeed, the Epicurean polemic and engagement with Democritus on such issues is presumably one of the major reasons for our present difficulties in reconstructing Democritus' own opinions on such questions as the nature of the gods and the possibility of divination and prophecy from generally post-Epicurean sources. It is certainly possible that Plutarch, although himself no friend to the Epicureans, is relying at least in part for his information on Democritus' views on Epicurean or Epicurean-influenced sources.

I want to leave open many of the interesting questions about Democritean theology and demonology posed by these sources. For my purposes, I want to take from them a rather general thesis, namely that, according to Democritus, *eidola* given off by people, especially people in extreme emotional states, carry and preserve the imprint of that psychic state. When they lodge in the soul of someone else, therefore, this psychic imprint can affect the perceiver's soul too. Violent and malevolent emotions, particularly envy (φθόνος; see [68 B 245] and Plut. *Quaest. conv.* p. 681 D), tend to damage and harm the perceiver's own soul. (There may, of course, be particular and special cases of this phenomenon when the perceiver is asleep or the *eidola* are of a particular sort which would give rise to such things as prophecies. I mean to concentrate, however, on the more 'mundane' cases.) In this way, therefore, Democritus is able to offer a physical, atomist account of the mechanism of interpersonal psychic harm. One person's envy can be transmitted to and harm others. There is no reason in principle why this should be restricted to cases of intentional malevolent magic, or the 'evil eye'. Rather, this mechanism offers a neat atomist explanation for a range of phenomena which involve one person's state of mind affect-

²³ See e.g. Diog. Oin. 10.IV.10ff., 43.I.12–II.14, which, like Plutarch. *Quaest. conv.* p. 683 A, claim that these *eidola* have 'perception', and cf. Sext. Emp. *Adv. math.* IX 19 and 42–48. Plutarch and other later sources may well be responding to a hostile Epicurean version of Democritus' views. Note the contrast with Democritus' views implied by Cleombrotus' view of Epicurean *eidola* at *De def. orac.* 420 B. Cf. Clay (1980) and Morel (1996) 295–305.

ing another's, from the psychic trauma associated with being the victim of a crime to the general state of anxiety and disturbance aroused in a population by revolutionary or hostile political factions.²⁴ If we return to the fragments with which we began, this mechanism for explaining the damage done by hostile intentions could shed light on the robust view taken by Democritus against not only those who do wrong, but also those who intend to do wrong.

IV

First, however, recall fragment 68 B 33:

[68 B 33] (Clem. Al. *Strom.* VI 151, Stob. II 31, 65):

ἡ φύσις καὶ ἡ διδασχὴ παραπλήσιόν ἐστι. καὶ γὰρ ἡ διδασχὴ μεταρυσμοῖ τὸν ἄνθρωπον, μεταρυσμοῦσα δὲ φυσιοποιεῖ.

Nature and teaching are alike. For teaching rearranges a person and by rearranging it creates his nature.

The vocabulary used here to describe the effect of teaching has been found strongly reminiscent of certain key terms in Democritean physics, in particular the term used to describe the shape of atoms within a compound, ῥύσμος²⁵. Does this fragment therefore suggest that Democritus considered teaching to involve the rearrangement of the pupil's atomic soul—a further possible link between ethically important interpersonal behaviour and atomist physics? It is hard to be sure, but it is not an implausible thought that Democritus considered teaching to involve the impact of the teacher's words and image on the pupil's soul, whether or not the vocabulary in this fragment conclusively demonstrates that this was indeed his view.²⁶ Teaching, of course, is a case of

²⁴ Cf. Cambiano (1980) 449: 'Incorporato nei quadri teorici dell'atomismo, anche il malocchio sembra perdere i caratteri di eccezionalità. Ogni flusso di *eidōla*, soprattutto se proviene da esseri viventi, può perturbare. Ciò dipende dalle proprietà degli oggetti da cui proviene e dalle condizioni del suo itinerario.'

²⁵ Aristot. *Met.* 985b13–19.

²⁶ Cf. Tortora (1984); Müller (1980) 331; Furley (1987) 156; and Taylor (1999) 233: 'Teaching, like thought and perception, is for Democritus a physical process involving the impact of *eidōla* on the soul, with consequent rearrangement of the soul aggregate ... Acceptance of that causal picture does not, of course, commit one to endorsing the thesis that Democritus sought to derive ethical conclusions from his physical theory,

an interpersonal activity or relationship in which, if it is successful, the changes in the soul of one or other participant, come about through verbal and visual means. It contrasts strongly with medicine, for example, which might also be said to 'rearrange' someone (μεταρρυθμίζειν), but in which any change in the patient's physical state can be accounted for by the introduction into his body of drugs or by the application of surgical procedures and might also be contrasted with the effects of excessive heat and cold which, according to Theophrastus, were said by Democritus to interfere with the soul's functioning by altering the arrangement of the elements of the soul (Theophr. *De sens.* 58).²⁷ If teaching can rearrange the soul, then perhaps we should similarly accept that other forms of interpersonal relationships, including hostile ones, can produce the same sort of effect. This mechanism would work for many other forms of social interaction, of socialisation, of character formation and moulding. They can all likewise be conceived as involving also the rearrangement of the physical constituents of the participants as a result of their interactions.²⁸

Looking back to the fragments on treating criminals and potential criminals like harmful beasts, and those which insist on the necessity for swift, decisive, and legitimate action against wrong-doers, I think it is entirely plausible that Democritus conceived of the impact upon the souls of persons affected, positively and adversely, by the intentions and characters of others, in terms of the interaction between the recipient and atomic *eidola* produced by the influencing agent. There is no difficulty, I think, in imagining this to be a relatively common effect since, after all, on Democritus' view we are all always producing such *eidola*, and it is not difficult to imagine that he was impressed by cases of public panic or hysteria, the psychological effects and causes of *stasis*, and other general public moods, whether positive or negative. Here, therefore, is an example of a readily available Democritean physical psychological account of a social and political phenomenon which might account for the prominence in many of the ethical fragments of an

or that he believed that there are law-like connections between physical and ethical descriptions.' Cf. Vlastos (1945–1946) 54–55, and the response to Taylor (1967) added to n. 79 on page 342 of the article as reprinted in D.W. Graham ed. *G. Vlastos: Studies in Greek philosophy* volume 1 (Princeton, 1995).

²⁷ Cf. Warren (2002) 64–71.

²⁸ Cf. [68 B 184] (Stob. II 31, 70): φάτων ὁμίλη συνεχῆς ἔξιν κακίης συναύξει; [68 B 190] (Stob. III 1, 91): φάτων ἔργων καὶ τοὺς λόγους παραιτητέον.

emphasis on the importance of good or bad intentions and the respective benefit and harm they produce.²⁹

At this stage, a further question might suggest itself. If such a connection between ‘personal *eidola*’ and psychological benefit and harm is accepted, can we infer anything further about the overall structure of Democritus’ thought? Can we determine which came first, the physical psychological story or the social and legal observations? In other words, did Democritus derive this view of the effects of interpersonal relationships from his physical theories, or did he construct his physical and psychological theory in order to account for an independently recognised psychological phenomenon?³⁰ Unfortunately, I can see no way to decide definitively on a view about Democritus’ direction of thought and, in any case, there is no way to discount a process of combined reflection in both areas, each informing the other. We simply lack any relevant evidence setting out the whole of Democritus’ views in such a deductive system and, even if some such text were available, we would be no better placed to decide what Democritus’ own order of thought had been in constructing his views as opposed to the order of explanation he favoured for setting out his completed philosophy.

It is true that the ethical fragments I have concentrated on here make no explicit reference to the physics of perception or atomist psychology and they can certainly be understood in the absence of any knowledge of Democritus’ physical views. So the proposed connection must remain to that extent speculative. Nevertheless, once viewed in the broader context of Democritus’ views about the interpersonal harms and benefits transmitted from soul to soul through the physical medium of *eidola*, these otherwise often frustratingly gnomic assertions can be firmly placed not only within the context of the ethical thought of Democritus’ contemporaries—valuable and important though that is—but also within the other aspects of Democritean philosophy.³¹ We might therefore offer this proposed connection as a case of ‘reciprocal

²⁹ I assume that this application of an *eidola* mechanism corroborates the comments of Morel (1996) 319: ‘Ces textes montrent donc que la théorie des simulacres constitue une explication générale susceptible d’applications multiples.’

³⁰ Note the direction of explanation assumed by Guthrie (1965) 482: ‘Here at least the limits of materialist explanation seem stretched to breaking point in order to accommodate the popular beliefs of his time. The superstition of the evil eye is justified in similar terms: envious people emit images which convey their own ill-will and power for harm and by implanting themselves in the victim injure him both bodily and mentally.’

³¹ Compare the approach of Procopé (1971) and (1989) 309–310. Farrar (1988) is

illumination' between two areas of Democritean thought. His ethical views on psychological harm and his views on personal *eidola* can shed light on one another insofar as our appreciation of his view of the ethical importance of intention and the damage caused by envy may be deepened by seeing it in the context of his theory of personal *eidola* and, in turn, that theory of personal *eidola*—while it may also be doing some explanatory work in his theology—can offer some explanatory background to his view of the ethical importance of intentions and the possibility of psychological harm.

Of course, my proposed connection between *eidola*-theory and the ethical importance of the interpersonal effects of intentions and emotional states is insufficient to stand alone as an argument for seeing all of Democritean natural philosophy and ethical thought as interconnected areas of a single consistent and mutually reinforcing philosophical system.³² This is hardly unexpected, nor is it a reason for disappointment. After all, it is more than unlikely that a single piece of text or example of terminological vocabulary will prove to the satisfaction of most commentators an atomist physical background to all of Democritean ethical thought. Nor will any one proposed link between atomist psychological views and the ethical opinions bear the weight of such a conclusion about Democritus' philosophy as a whole. However, I do not, on the other hand, think that we must therefore rest content with merely sketching possible applications of atomic physical theory in Democritus' wider philosophy. To make any progress in this area, we will have to reconsider what sort of evidence would be needed to make a plausible case. In the face of the state of the fragments and testimonia we have, it may well be necessary to re-think what the standards of proof might be. If we try to begin without prejudicial assumptions about the presence or absence of a link between Democritean ethics and physics, an alternative approach to the question would consider each of the proposed connection between areas of Democritus' thought

more prepared to view Democritus' philosophy as a whole as a background to his ethics.

³² Hence I hope to avoid the sort of criticism aimed at Vlastos by Taylor (1967) 10: 'So if Vlastos had been content to advance his thesis as a conjectural account of that Democritus may have held, if he applied his principle without inconsistency, it could have been accepted as providing a useful insight into the possibilities of the atomic theory. Unhappily, however, he went further, claiming to find in the texts explicit support for the contention that Democritus in fact made the link between the ethics and physics which his investigations had shown to be possible.'

individually and then consider the combined persuasive weight of all such possible connections. If only a few, perhaps tenuous, proposals can be made, then the overall case for seeing systematic links between Democritus' ethics and physics must remain clouded in reasoned scepticism. However, the more such possible connections are offered, and the more plausible those connections are, although no one such connection will suffice on its own, the more the cumulative effect will be one of adding greater and greater plausibility to a general view of Democritus, and the relationship between his ethical thought and his philosophy as a whole.

DEMOCRITE ET L'OBJET DE LA PHILOSOPHIE NATURELLE. A PROPOS DES SENS DE ΦΥΣΙΣ CHEZ DEMOCRITE

PIERRE-MARIE MOREL

Démocrite est incontestablement un philosophe de la nature, et il a été justement perçu comme tel par l'ensemble de ses lecteurs antiques. Il l'est du reste à plus d'un titre. D'une part, comme tous ceux qu'Aristote qualifie de 'physiciens', il a proposé une conception rationnelle et fondamentalement *archéologique* de la nature, au sens où il a donné un *principe* général d'explication applicable à toutes ses manifestations. Il a même produit l'une des explications les plus économiques qui soient de l'ensemble des phénomènes naturels, observables ou non, réguliers ou exceptionnels, en rapportant toute modification de structure aux différences atomiques et au vide. D'autre part, affirmant que la Nécessité est le principe de toutes choses,¹ il a exclu dans ce domaine toute cause 'surnaturelle', comme un intellect organisateur ou une providence transcendante. En ce sens, Démocrite est l'un des représentants les plus radicaux de la tradition d'enquêtes 'sur la nature' (περὶ φύσεως) qui connaît son apogée au Ve siècle.² Aussi G. Naddaf, dans la vaste étude qu'il a consacrée à cette tradition, n'hésite-t-il pas à y adjoindre Démocrite et Leucippe.³ De fait, nous trouvons dans le *corpus* abdérítain des textes qui relèvent des trois dimensions constitutives de toute *historia peri phuseôs* selon Naddaf: la cosmogonie, l'étude de la nature de l'homme et l'explication de la genèse des sociétés. Selon lui, les deux traités intitulés *Grand système du monde* et *Petit système du monde*, qui figurent dans le catalogue des œuvres de Démocrite, 'pris comme un tout, (...) présentent une description de l'origine et de l'évolution de l'univers,

¹ Voir notamment Diog. Laert. IX 45 [68 A 1]; [Plutarch.] *Stromat.* 7 [68 A 39]; Aristot., *De gen. an.* V 8. 789b2-4 [68 A 66]; Leucippe cité par Aétius: Aet. I 25, 4 [67 B 2].

² Pour un aperçu des arguments en faveur ou en défaveur de l'authenticité de ce titre chez les présocratiques, voir Kirk-Raven-Schofield (1983²) 102-103 n. 1; Naddaf (1992) 17-19.

³ Voir Naddaf (1992) 239-250.

de l'homme et de la société, bref une *historia* de type *peri phuseôs*.⁴ Si l'on s'en tient à ces généralités, la question de l'objet de la philosophie naturelle de Démocrite ne fait pas problème.

Pourtant, les choses deviennent nettement plus complexes si l'on se demande quel type de 'physicien' est en réalité Démocrite. La question peut s'entendre de deux manières: quelle est la délimitation épistémologique de cette physique, par opposition à une théorie de la connaissance ou à une éthique? Ou bien: quelle est précisément la *phusis* que cette science est supposée prendre pour objet? La première question est extrêmement vaste si nous la formulons en ces termes. Du reste, il n'est pas certain que nous puissions y répondre directement, dans la mesure où les grandes catégories épistémologiques que l'on vient d'évoquer ne sont sans doute pas pertinentes avant Aristote. Appliquées aux philosophes dits 'présocratiques', elles sont en réalité des commodités de langage, quand elles ne sont pas des projections anachroniques, héritées de la doxographie et des témoignages dans leur ensemble. Aussi ai-je choisi de privilégier, beaucoup plus modestement, la seconde question—quelle est la *phusis* dont s'occupent les premiers atomistes?—, en espérant qu'elle nous permettra de revenir à la première en des termes plus proches de ceux que pouvait utiliser l'Abdérítain. C'est d'ailleurs la méthode que Naddaf entend appliquer à l'ensemble des *Peri phuseôs* qu'il étudie. Cela signifie, pour indiquer les limites de la présente étude, que j'aborderai assez peu la question de la méthode et des conditions épistémologiques de la physique abdérítaine. Je concentrerai mon analyse sur deux points: l'existence ou l'absence d'une *historia peri phuseôs* chez Démocrite, et la signification du terme φύσις dans les fragments et les témoignages. Concernant le premier point, rien ne dit, comme nous le verrons, que Démocrite ait été l'auteur d'un unique traité portant ce titre, ni même qu'un tel projet, pris littéralement, ait eu pour lui un sens. Autant le dire dès à présent, le schème commun dégagé par Naddaf s'applique mal à Démocrite, notamment si l'on adopte la méthode qu'il préconise lui-même, et qui consiste à partir des occurrences de φύσις. Du reste, lorsqu'il se pose la question du sens de φύσις chez Démocrite,⁵ il n'en retient qu'un seul—la 'réalité stable et permanente' que constituent 'les atomes et le vide'—, alors qu'il y en a d'autres et que ce sens n'est pas le plus fréquent ni le plus déterminant. Cela rend d'autant plus nécessaire l'examen précis

⁴ Naddaf (1992) 240.

⁵ Naddaf (1992) 290–291.

de l'usage abdéritain du concept de φύσις, car c'est la base textuelle la plus sûre dont nous puissions disposer pour tenter de savoir en quel sens nous avons affaire à une philosophie *de la nature*.

Par ailleurs, nous devons nous rappeler que la notion présocratique de *nature* est loin d'être univoque. Nous pouvons schématiquement distinguer trois manières, parfois combinées, de l'entendre: la nature comme matière primordiale, et ainsi comme essence de la chose considérée ou comme essence des choses en général, par opposition notamment aux apparences et à ce qui relève de la loi instituée ou de la convention (νόμος); la nature comme processus et en particulier comme génération;⁶ la nature comprise comme l'ensemble des choses telles qu'elles sont et des forces ou lois qui les régissent. Comme nous le verrons, l'examen des occurrences de φύσις dans le *corpus* démocratéen tel qu'on peut le reconstituer nous apprend que ces trois catégories suffisent difficilement à les classer. Il y a néanmoins un point positif: alors que nous disposons de très peu de fragments véritables concernant la physique de Démocrite, de sorte que nous sommes étroitement tributaires des témoignages et qu'il serait absurde de vouloir s'en affranchir pour étudier dans le détail la physique abdéritaine, les fragments proposent plusieurs emplois significatifs de φύσις. Nous verrons même que ces emplois permettront de nuancer, voire d'infléchir, l'impression que laissent les témoins et les doxographes sur ce que peut être la nature selon Démocrite.

La première question que nous devons nous poser est de savoir si nous disposons d'indices concluants de l'existence d'un *Peri phuseôs* démocratéen. L'article de W. Leszl, dans le présent volume, examine très précisément le rapport entre les titres conservés et les œuvres de Démocrite et je me contenterai d'une interprétation minimale des titres rapportés par Diogène Laërce, dans sa reproduction du catalogue de Thrasyllé.⁷ En premier lieu, même si nous décidons de conserver les titres cités par l'astrologue Alexandrin, dont certains sont attestés par d'autres sources, le classement en tétralogies est très probablement dû à Thrasyllé,⁸ et le fait que celui-ci procède de même avec les œuvres de Platon

⁶ C'est aux yeux de Naddaf le sens le plus important. Voir notamment Empédocle cité par Plutarque, *Adv. Col.* p. 1111 F [31 B 8].

⁷ IX 45-49 [68 A 33].

⁸ Tarrant (1993) 85. Sur les raisons de l'intérêt de Thrasyllé pour Démocrite et pour une analyse de la composition de son catalogue, je renvoie également à Mansfeld (1994) 97-105.

montre bien que ce système ne doit en tout cas rien à Démocrite. Les titres de rubriques (Ἡθικά—Φυσικά—Μαθηματικά—Μουσικά—Τεχνικά), sans même parler des livres non classés, ne doivent donc pas être pris en compte, sinon pour l'intelligence du projet de Thrasyllé lui-même. Il est également douteux que les quatre tétralogies placées sous la rubrique Φυσικά aient été originellement—c'est-à-dire par Démocrite lui-même—aussi nettement séparées des autres œuvres du *corpus* et, plus encore, que Démocrite ait lui-même cherché à délimiter une rubrique épistémologique qu'il aurait nommée 'physique'. La difficulté est évidemment redoublée par les possibles interventions de Diogène dans l'établissement du catalogue. Il est, ainsi, tout à fait possible que la formule qui marque la fin de la liste des traités de 'physique', ταῦτά καὶ περὶ φύσεως, soit de Diogène et non de Thrasyllé. Ce n'est pas, en tout cas, l'énoncé d'un titre de Démocrite.

Dans cette rubrique, les deux premiers titres de la deuxième tétralogie sont: 1. Περί φύσεως πρῶτον 2. Περί ἀνθρώπου φύσιος (ἢ Περί σαρκός) δεύτερον. Ces titres peuvent se comprendre de deux manières,⁹ (a) selon Diels:¹⁰ *Sur la nature*, livre I 'ou *Sur la nature du monde*'; *Sur la nature*, livre II, ou *Sur la nature de l'homme*, ou *Sur la chair*; (b) selon une hypothèse proposée par D. O'Brien:¹¹ *Sur la nature*, en un livre; *Sur la nature de l'homme* (ou *Sur la chair*), en deux livres. Le problème est donc de savoir si nous sommes devant un seul livre dont chaque partie porterait un sous-titre (Diels), ou bien si nous avons affaire à deux livres distincts (O'Brien). Le choix de Diels se justifie peut-être par le thème démocritéen de l'homme comme *mikrokosmos*,¹² ce qui ferait du deuxième livre une sorte de complément du premier, ou par l'indication de la *Suda*, selon laquelle Démocrite aurait écrit deux ouvrages authentiques, un *Grand système du monde* (Μέγας διάκοσμος) et un *De la nature du monde* (Περί φύσεως κόσμου).¹³ On regrette qu'il n'ait pas donné de traduction de la glose 'ἢ ΠΕΡΙ ΚΟΣΜΟΥ ΦΥΣΙΟΣ', car il serait intéressant de savoir s'il comprend φύσιος au sens de structure ou au sens de genèse, cette dernière option introduisant alors un lien possible avec la cosmogonie de Leucippe. Signalons à cette occasion que la philosophie naturelle des

⁹ Présentées par Brunschwig (1999) 1082 n. 4.

¹⁰ Diels-Kranz (1985) II, 138, l. 16–19. Diels complète le premier titre par: 'ἢ ΠΕΡΙ ΚΟΣΜΟΥ ΦΥΣΙΟΣ'.

¹¹ O'Brien (1994) 686.

¹² Voir les textes figurant sous le n° 68 B 34: David *Prol.* 38, 14; Galen. *De usu partium* III 10.

¹³ *Suda* article 'Démocrite' [68 A 2].

atomistes ne peut être intégralement définie comme une ‘cosmogonie’, puisque celle-ci n’est qu’une particularisation de la physique générale des atomes et du vide. Le *kosmos* ne saurait être l’équivalent de la *phusis*, qui l’excède logiquement, puisqu’il y a dans le Tout une infinité de mondes. Sans même aborder le point discuté du contenu et de l’attribution du Μέγας διάκοσμος,¹⁴ ni la question de la délimitation des deux titres ni celle de leurs contenus respectifs ne me semblent pouvoir être tranchées.

Existe-t-il, par ailleurs, un Περί φύσεως qui engloberait l’ensemble des traités sur la nature, et dont nos deux titres ne désigneraient que des sections parmi d’autres, mais des sections qui auraient pour particularité d’être éponymes par rapport au titre d’ensemble? Vitruve avoue son admiration pour ‘les livres de Démocrite *Sur la nature*’ (*Democriti de rerum natura volumina*),¹⁵ ce qui peut laisser penser que de nombreux traités démocritéens se rangeaient sous un ‘chapeau’ intitulé ‘*Sur la nature*’. Toutefois, il confond manifestement, dans ce passage, l’authentique Démocrite avec son imitateur hellénistique, Bolos de Mendès, puisqu’il cite également un traité *Des choses faites à la main* (Χειροκμηίων) attribué à ce dernier.¹⁶ Nous n’avons pas d’autres indications textuelles à ma connaissance. Tout au plus pouvons-nous nous demander si Démocrite a formé l’équivalent d’un *projet* relevant du genre *Peri phuseôs* et comment il a pu le concevoir.

Vittorio Enzo Alfieri s’est posé cette question dans *Atomos idea*, l’important ouvrage qu’il a consacré aux premiers atomistes.¹⁷ Il est parvenu à cette conclusion que les atomistes ont bien conçu le projet d’un *Peri phuseôs*, comme les autres présocratiques, mais un *Peri phuseôs* d’un type nouveau, extrêmement particularisé et diversifié. Ce verdict semble dans un premier temps difficilement compatible avec la réduction de la connaissance authentique aux principes élémentaires, qui seuls existent ‘en réalité’, alors que tout le reste—et notamment les propriétés sensibles—n’est que selon la croyance ou la convention.¹⁸ Si seuls existent véritablement—dans la *nature* ou comme *natures*—les

¹⁴ Voir O’Brien (1994) 690–693. La difficulté n’est pas mentionnée par Naddaf (1992) 240, lorsqu’il aborde ce traité.

¹⁵ *De arch.* IX pref., 14 [68 B 300, 2].

¹⁶ Voir Diels-Kranz (1985), II, 210.

¹⁷ Alfieri (1979²) 61.

¹⁸ Voir notamment Aet. IV 9, 8 [67 A 32]; Diog. Laert. IX 72 [68 B 117]; Galen. *De elem. sec. Hipp.* I 2 [68 A 49] et *De exp. med.* XV, ed. Walzer-Frede [68 B 125]; Sext. Emp. *Adv. math.* VII 135 [68 B 9].

atomes et le vide et si, seuls, ils font l'objet d'une connaissance fiable, alors ils devraient être les seuls objets légitimes d'une enquête *Peri phuseôs*. Ainsi, la diversité des enquêtes particulières, où s'impose le recours à l'expérience sensible, serait privé de toute légitimité épistémologique.

En réalité, comme j'ai tenté de le montrer ailleurs,¹⁹ Démocrite, bien qu'il soit 'remonté aux atomes' (ἐπὶ τὰς ἀτόμους ἀνέβη) pour reprendre l'expression de Simplicius,²⁰ et bien qu'il se soit efforcé de rendre compte des phénomènes en termes de figures et de mouvements proprement atomiques, ne limite pas sa recherche des 'étiologies'²¹ à un strict réductionnisme méthodologique.²² Il reconnaît et caractérise, au niveau des composés observables, un certain nombre de propriétés constantes et d'effets de structure, de convergences de facteurs et de séries causales, autant de données empiriquement discernables, qu'il est indispensable de prendre en compte dans l'explication des phénomènes. C'est ainsi, par exemple, que l'on peut parler d'espèces et que nous pouvons dire que 'nous savons tous ce qu'est l'homme',²³ alors qu'il n'y a pas d'espèces, en toute rigueur, dans l'univers atomiste, mais simplement des effets d'inertie qui garantissent la relative régularité de la reproduction spécifique.

Prenons un exemple particulièrement révélateur de cet élargissement du domaine de l'enquête physique: celui de la génération. Au livre IV du traité *De la génération des animaux*,²⁴ Aristote attribue explicitement à Démocrite la thèse dite aujourd'hui de la *pangenesis*, doctrine selon laquelle la semence provient de l'ensemble du corps vivant. Celui-ci

¹⁹ Morel (1996).

²⁰ Simpl. *De cael.* 564.24 [68 A 120].

²¹ Voir le texte de Denys d'Alexandrie chez Eusèbe de Césarée, *Praep. evang.* XIV 27, 4 [68 B 118], qui rapporte que Démocrite préférerait trouver une seule *aitionologia* (explication ou relation causale), plutôt que devenir roi des Perses.

²² Et cela par opposition à un réductionnisme ontologique. Il est difficilement contestable que Démocrite soit un réductionniste ontologique, tout au moins du point de vue de sa doctrine fondamentale. Cela ne signifie pas que sa méthode de recherche causale soit elle-même intégralement réductionniste, au sens où elle ne considérerait que les propriétés des atomes, à l'exclusion des propriétés des composés et des données de l'expérience sensible.

²³ Voir notamment deux textes réunis par Diels-Kranz sous le n° 68 B 165: Sext. Emp. *Adv. math.* VII 265 et la variante épicurienne en VII 267 (Épicur. fgt 310 Usener).

²⁴ En *De gen. an.* IV 3. 769a17–19, Démocrite et Empédocle sont désignés parmi ceux qui estiment que le sperme vient de tout le corps. Pour d'autres physiciens, rappelons-le, comme Alcmeon, Zénon mais aussi Leucippe (Aet., V 4, 1 [67 A 35]), la semence vient du cerveau. Pour Parménide et Diogène d'Apollonie, puis pour Aristote, elle trouve son origine dans le sang. Le *corpus* hippocratique hérite de Démocrite le modèle de la *pangenesis*. Voir par exemple Hippocr. *De genit.* III; *De aëre aqu. loc.* XIV.

se définit donc ici, non pas par sa composition atomique, mais par son anatomie et sa structure organique perceptible. La reproduction sexuée n'est que la reproduction de cette structure. Ainsi, selon le témoignage d'Aristote, les parties externes se différencient avant les parties internes.²⁵ Conformément à cette idée d'une prévalence de la morphologie générale sur les composants, Démocrite pense, selon Aristote, que l'embryon demeure dans l'utérus pour être modelé aux traits de sa mère.²⁶ Ce texte pose d'ailleurs un problème. La mère participe à la génération en fournissant une semence et, à première vue, la concurrence entre cette semence et celle du père devrait être achevée dès la formation de l'embryon. Or ce témoignage montre que l'hérédité maternelle peut encore s'exercer durant le temps de la gestation. Les textes dont nous disposons ne permettent pas de lever totalement cette ambiguïté. L'essentiel est de toute façon ailleurs, dans l'allusion à la thématique du moulage, que l'on décèle derrière l'usage du verbe διαπλάττω. À l'inverse de l'explication qui sera celle d'Aristote, les parties externes se forment d'abord, parce que le facteur formel de l'hérédité consiste dans la ressemblance structurelle. Le principe du moulage ou du modelage est donc particulièrement pertinent pour rendre compte de la transmission des caractères. Ce même modèle se retrouve d'ailleurs à plusieurs reprises dans l'explication de la vision. Les effluves s'impriment dans l'air comme le cachet dans la cire²⁷ et, selon Plutarque, les simulacres viennent marquer de leur sceau le dormeur ou celui qui a été envoûté.²⁸ Ces témoignages confirment donc l'existence d'un modèle étiologique de l'empreinte ou du moule dont la pertinence explicative ne se situe pas au niveau atomique.

La distinction implicite de différents niveaux d'analyse causale et la reconnaissance de structures relativement stables au niveau des composés justifient la diversité des enquêtes spécialisées, dont le catalogue de Thrasyllé, notamment, atteste l'existence: sur l'homme et les animaux, mais aussi sur les sens, les couleurs, les phénomènes célestes, aériens, terrestres, etc. Le fait que cette démultiplication des domaines scientifiques pose un problème général de cohérence épistémologique, en particulier au regard des fragments qui traduisent un scepticisme cri-

²⁵ *De gen. an.* II 4. 740a13-15 [68 A 145].

²⁶ *De gen. an.* II 4. 740a33-37 [68 A 144].

²⁷ Theophr. *De sens.* 51; 54 [68 A 135].

²⁸ Plutarch. *Quaest. conv.* VIII 10, 2 p. 734 F et V 7, 6, p. 682 F [68 A 77]. Dans le second texte, Plutarque use du verbe ἐμπλάττω pour désigner l'influence du regard des sorciers.

tique à l'égard de l'observation sensible,²⁹ n'enlève rien à ma première conclusion. Celle-ci tempère le verdict d'Alfieri (l'idée d'un *Peri phuseôs* démocritéen), tout en justifiant son intention fondamentale. Démocrite n'est sans doute pas l'auteur d'un traité intitulé 'Περὶ φύσεως', unique et englobant. Il n'est pas non plus, à l'inverse, le concepteur d'une physique intégralement réductionniste, au sens où elle n'aurait d'autre objet que les éléments de premier niveau, les atomes et le vide, et où elle exclurait les composés perceptibles ainsi que, par ce biais, les enquêtes spécialisées. Toute la difficulté, pour avoir une idée claire de l'objet de la philosophie démocritéenne de la nature, consiste à articuler une *archéologie* fondamentale radicalement réductionniste avec une méthode étiologique qui, de toute évidence, ne l'est pas. La question, sous cette forme, est trop générale pour être reprise ici. Nous allons voir, cependant, que les fragments de Démocrite font un usage du concept de nature qui permet de préciser les termes du problème.

Examinons maintenant les occurrences de φύσις dans le *corpus* démocritéen. Si, à titre indicatif, nous prenons la seule section 68 (Démocrite) de la collection de Diels-Kranz, nous comptons 75 occurrences de φύσις et de ses dérivés pour la partie A (témoignages) et 57 pour la partie B (fragments). En réalité, ce deuxième chiffre n'est guère significatif, car certaines occurrences appartiennent au contexte citationnel et non au fragment lui-même. De plus, 17 d'entre elles viennent de la longue sous-section 68 B 300, qui rassemble des textes douteux. Une douzaine d'occurrences peuvent être attribuées en propre à Démocrite. Notons que ce score n'est pas si mauvais, si l'on songe à l'extrême rareté, dans les fragments, de l'emblématique ἄτομος. Dans les témoignages, et si l'on fait là encore abstraction des occurrences purement contextuelles ou des tournures adverbiales du type 'par nature' ou 'contre nature', le sens (I) qui domine est celui d'essence des choses. Il peut s'agir de la 'nature des qualités sensibles'—selon qu'elles sont composées de telles ou telles figures atomiques, lisses ou rugueuses par exemple—, comme dans le témoignage de Théophraste sur la sensation.³⁰ Dans ce cas, nous n'avons aucune garantie que le terme employé par Théophraste l'ait été également par l'Abdéritain, d'autant que le premier reproche au second de se contredire, en tentant d'un côté de caractériser les sen-

²⁹ Sur les tensions et les apories qui caractérisent la théorie démocritéenne de la connaissance, je renvoie à Morel (1998).

³⁰ *De sens.* 49–83 [68 A 135].

sibles par leur 'nature' atomique et en affirmant de l'autre que 'les sensibles n'ont pas de nature parce que tous ne perçoivent pas les mêmes phénomènes'.³¹ En revanche, toujours au sens (I), φύσις apparaît dans de nombreux témoignages, de manière beaucoup plus fiable, comme équivalent d' 'atome'. C'est notamment le cas chez Aristote³² et dans un fragment de Diogène d'Énoanda sur les éléments.³³ Corrélativement, φύσις désigne le mode d'existence des principes, les atomes et le vide, par opposition à l'existence purement conventionnelle des qualités sensibles chez Aétius,³⁴ Galien,³⁵ Sextus Empiricus,³⁶ Diogène Laërce.³⁷ La valeur de ces témoignages est renforcée par un texte de Simplicius qui attribue expressément l'assimilation *phusis*-atomes aux premiers atomistes:

'la nature,' c'est-à-dire les corps naturels, premiers et insécables. Ceux-là les appelaient en effet 'nature' et ils disaient que, mis en mouvement en vertu de leur poids propre, ils se meuvent localement au travers du vide qui cède et ne résiste pas.³⁸

Le fait que 'nature' soit ici au singulier, comme dans le texte d'Aristote que Simplicius commente, ne doit pas nous arrêter. Le propos du texte n'est sans doute pas de dire que la nature, comme totalité, n'est autre que les atomes, mais plutôt que les atomes constituent la nature de chaque chose et que cette nature atomique est soumise au mouvement local, ce qui suppose l'existence du vide. C'est dans un autre contexte

³¹ μή ἐστι φύσις τῶν αἰσθητῶν διὰ τὸ μὴ ταῦτὰ πᾶσι φαίνεσθαι, *De sens.* 70 [68 A 135].

³² *De cael.* I 7. 275b32 [67 A 19]; cité dans *Simpl. De cael.* 294.33 sq. = fgt 208 Rose [68 A 37]; *Phys.* VIII 9. 265b24-26 ('la nature' désigne manifestement les atomes; voir le texte de Simplicius traduit ci-dessous).

³³ 'quant à Démocrite d'Abdère, il a dit qu'il s'agissait des natures indivisibles, et il a bien fait de le dire' (Δημόκριτος δὲ ὁ Ἀβδηρείτης εἶπε μὲν ἀτόμους φύσεις, καλῶς γε ποιῶν), Fgt 6 II 9-11 Smith. Dans la tradition épicurienne encore, et probablement dans la continuité de la physique démocratéenne, Philodème évoque les 'natures premières' (τὰς πρώτας...φύσεις), à savoir les atomes, qui subsistent après la décomposition des cadavres, lorsqu'il évoque la théorie démocratéenne de la putréfaction. Voir Philod. *De mort.* XXX 1 Mekler [68 B 1a].

³⁴ Aet. IV 9, 8 [67 A 32].

³⁵ Galen. *De elem. sec. Hipp.* I 2 [68 A 49].

³⁶ Sext. Emp. *Adv. math.* VIII 6 [68 A 59].

³⁷ 'Les qualités existent par convention, mais c'est par nature qu'existent les atomes et le vide' (ποιότηας δὲ νόμῳ εἶναι, φύσει δ' ἄτομα καὶ κενόν), Diog. Laert. IX 45 [68 A 1].

³⁸ τουτέστι τὰ φυσικὰ καὶ πρώτὰ καὶ ἄτομα σώματα· ταῦτα γὰρ ἐκείνοι φύσιν ἐκάλουν καὶ ἔλεγον κατὰ τὴν ἐν αὐτοῖς βαρὺτητα κινούμενα ταῦτα διὰ τοῦ κενοῦ εἰκοντος καὶ μὴ ἀντιτυποῦντος κατὰ τὸπον κινεῖσθαι, *Simpl. Phys.* 1318.33-36 (commentaire à VIII 9. 265b24-26) [68 A 58; 68 B 168].

que la tradition péripatéticienne témoigne de l'intérêt que les Abdéritains pouvaient avoir pour la nature comme totalité. Il s'agit alors d'indiquer que les atomes—ici les 'éléments' (στοιχεῖα)—sont la 'réserve séminale totale' (πανοπεριία) de la nature tout entière.³⁹ La formule de Simplicius 'ceux-là les appelaient en effet "nature"' est en tout cas un indice fort en faveur de l'usage de φύσις pour nommer les atomes, qui sont d'ailleurs désignés par plusieurs termes dans le *corpus* relatif aux Abdéritains (ἰδέα, ὕσμιός, στοιχεῖον). Il est donc logique que Diels-Kranz aient reporté cette citation dans la section B de la collection démocritéenne, en 68 B 168.

L'examen des fragments et des occurrences authentiquement démocritéennes réserve cependant des surprises, qui vont nous obliger à prendre quelques distances avec cette assimilation. Les fragments posent il est vrai un problème spécifique, étant donné que la plupart d'entre eux concernent l'éthique et non la physique. Or le rapport entre ces deux versants de la philosophie de Démocrite, on le sait, ne va pas de soi. Je ne peux reprendre ici ce débat complexe, ouvert par l'article justement fameux de G. Vlastos⁴⁰ en faveur de l'interprétation naturaliste de l'éthique démocritéenne. Toutefois, je ne veux rien présupposer quant à la distinction que Démocrite lui-même aurait faite entre des 'disciplines' telles que l'éthique et la physique, puisque l'usage systématique de ces catégories épistémologiques est plus tardif. Nous verrons au moins un cas où il est extrêmement difficile d'isoler l'usage moral de l'usage scientifique de *phusis*: le fragment 68 B 278 sur l'inclination naturelle des êtres vivants à se reproduire. Par ailleurs, comme on va le voir, les acceptions que les fragments permettent de dégager ont, pour la plupart, des incidences directes sur la définition de la nature 'physique'. D'une manière générale, nous n'avons aucune indication claire d'une intention, en quelque sorte pré-épicurienne, de subordonner la tranquillité de l'âme à la *connaissance* de la physique, mais les fragments proposent des traces, à mon sens indiscutables, de descriptions physiques des états mentaux et de certains comportements moraux.⁴¹

³⁹ Aristot. *De an.* I 2. 404a4–5 [67 A 28].

⁴⁰ Vlastos (1975).

⁴¹ C'est semble-t-il en ce sens que Taylor (1999) 233, comprend désormais la situation. Warren (2002) 72, estime que le débat ne peut être tranché et conclut que la connexion entre éthique et physique n'est pas une composante essentielle de l'éthique démocritéenne.

Pour revenir au terme φύσις, le sens 'élémentaire' (I), qui prévaut dans les témoignages, n'est attesté que dans un seul fragment, celui que nous avons analysé en dernier (68 B 168). Or il s'agit d'une attestation fort mince, à peine une citation, puisque Simplicius se contente de dire que les atomistes 'appelaient (les atomes) "nature"'. Il nous reste en revanche un certain nombre de fragments dans lesquels φύσις désigne une structure stable (II), identifiable au niveau des composés. Ainsi, les hommes craignent le temps qui suivra la mort, parce qu'ils 'ignorent la dissolution de leur nature mortelle' (θνητῆς φύσεως διάλυσιν οὐκ εἰδότες).⁴² De même, la 'nature' empêche l'écoulement des menstrues après la conception.⁴³ Dans ce cas, il est vrai, 'nature' désigne peut-être l'ordre général—au moins celui qui prévaut dans notre monde—selon lequel les choses se produisent. Je reviendrai plus loin sur ce sens, également représenté dans les fragments. Nous retrouvons la même ambiguïté au fragment 176: 'la fortune est généreuse, mais inconstante, alors que la nature se suffit à elle-même. C'est pourquoi celle-ci l'emporte, par sa moindre prodigalité et sa constance, sur les grandes choses que l'on espère'.⁴⁴ Il est assez difficile de savoir s'il s'agit ici de la constitution naturelle de l'homme ou de l'ordre général des choses.⁴⁵ La nature est en tout cas, dans son opposition à la fortune, un état stable ou stabilisé, qui contraste singulièrement avec le désordre méta-cosmique de la somme illimitée des atomes en mouvement.

Le fragment 68 B 278 reflète bien, à lui seul, la richesse et la complexité des acceptions de φύσις:

Les hommes croient qu'avoir une descendance fait partie des choses nécessaires par nature et selon une certaine condition originelle. Il en va manifestement de même chez les autres êtres vivants. Tous ont en effet des petits, par nature, mais pas en vue d'un quelconque avantage. Plus encore, quand ils naissent, ils se donnent du mal pour eux et les élèvent, comme ils peuvent, ils craignent pour eux tant qu'ils sont petits et sont affligés s'il leur arrive quelque chose. Telle est la nature de tous les êtres vivants. Mais chez l'homme, l'opinion s'est désormais imposée qu'il y avait aussi quelque avantage à tirer de ses petits.⁴⁶

⁴² Stob. IV 52, 40 [68 B 297].

⁴³ Plutarch. *De amore prol.* 3 p. 495 E [68 B 148].

⁴⁴ τύχη μεγαλόδοτος, ἀλλ' ἀβέβαιος, φύσις δὲ αὐτάρκης· διόπερ νικᾷ τῷ ἥσσονι καὶ βεβαίω τὸ μείζον τῆς ἐλπίδος, Stob. II 9, 5 [68 B 176].

⁴⁵ Bien que Vlastos (1975) 394, donne des arguments convaincants en faveur du sens physiologique, en se fondant notamment sur le corpus médical.

⁴⁶ ἀνθρώποισι τῶν ἀναγκαίων δοκεῖ εἶναι παῖδας κτήσασθαι ἀπὸ φύσιος καὶ καταστάσιός τινος ἀρχαίης. δῆλον δὲ καὶ τοῖς ἄλλοις ζώοισι πάντα γὰρ ἔκγονα κτᾶται κατὰ

Là encore, tout au moins dans la première occurrence de φύσις, on peut hésiter entre la nature entendue comme ordre général des choses et la nature comme constitution ou ensemble d'aptitudes spécifiques. Toutefois, le rapprochement avec κατάστασις, que je comprends non pas au sens d' 'institution' mais au sens de 'condition naturelle',⁴⁷ ainsi que l'expression 'la nature de tous les êtres vivants'⁴⁸ invitent à privilégier le second sens. Il s'agit en ce sens de la nature au sens physiologique, c'est-à-dire d'un emploi technique et non pas littéraire du terme. Le sens général du fragment confirme cette option: les hommes sont incités par leur nature à se reproduire, comme tous les vivants, mais ils n'y sont pas absolument contraints, d'autant qu'il n'y a pas d'utilité naturelle à avoir des enfants. Il y aurait même à cela beaucoup d'inconvénients, comme le montrent, non seulement notre fragment, mais aussi ceux dans lesquels Démocrite évoque la difficulté de l'éducation des enfants,⁴⁹ déconseille d'en avoir,⁵⁰ ou recommande de préférer, aux incertitudes de la procréation, l'adoption d'un enfant que l'on aura soigneusement choisi.⁵¹ L'idée qu'il y ait quelque avantage à attendre des enfants est donc un pur fait de convention ou d'usage, ce qui fait probablement écho à la disqualification épistémologique des qualités sensibles au nom de leur statut conventionnel. Ainsi, par opposition, ce que les hommes perdent de vue ne peut être que la nature au sens physique: non pas toutefois la nature atomique, mais la nature observable.

Par ailleurs, il y a quelques exemples de l'acception de φύσις comme ordre général des choses (III), en plus des connotations convergentes

φύσιν ἐποφελείης γε οὐδεμῆς εἵνεκα· ἀλλ' ὅταν γένηται, ταλαιπωρεῖ καὶ τρέφει ἔκαστον ὡς δύναται καὶ ὑπερδίδοικε, μέχρι σμικρὰ ἦ, καὶ ἦν τι πάθη, ἀνιάται. ἡ μὲν φύσις τοιαύτη πάντων ἐστὶν ὅσα ψυχὴν ἔχει· τῷ δὲ δὴ ἀνθρώπῳ νομίζον ἤδη πεποίηται, ὥστε καὶ ἐπαυρεσθὶν τινα γίγνεσθαι ἀπὸ τοῦ ἐκγόνου, Stob. IV 24, 33 [68 B 278].

⁴⁷ Diels: 'Urzustande'; Dumont (1988): 'institution primitive'; Taylor (1999): 'long-established constitution'. Le sens physique de κατάστασις (LSJ, II.2) est bien attesté dans le *corpus* hippocratique, par exemple dans *Airs, Eaux, lieux* (XI 12; XIX 28), dont l'auteur a pu être un proche du cercle démocritéen, comme l'a montré Diller (1934). Il fait l'objet d'un traitement systématique dans les *Épidémies*, où il désigne le rapport entre santé et maladie d'une part et conditions climatiques et géographiques d'autre part. Il est également attesté chez Hérodote, à propos de l'homme (*Hist.* II 173); le terme est joint à φύσις en *Hist.* VIII 83.

⁴⁸ Diels: 'natürliche Instinkt'; Dumont (1988): 'disposition naturelle'; Taylor (1999): 'nature'.

⁴⁹ Stob. IV 24, 29 [68 B 275].

⁵⁰ Stob. IV 24, 31 [68 B 276].

⁵¹ Stob. IV 24, 32 [68 B 277].

signalées ci-dessus. Diels présente par exemple comme une citation authentique le passage du *Commentaire au Cratyle* dans lequel Proclus range Démocrite, aux côtés d'Aristote, parmi les philosophes qui, comme l'Hermogène du dialogue platonicien, estiment que les noms sont attribués aux choses, non pas par nature (φύσει), mais par institution (θέσει).⁵² À vrai dire, si la thèse générale et les quatre arguments répertoriés par Proclus ont de bonnes chances d'être authentiques, il est très difficile de délimiter dans ce passage un véritable fragment démocritéen. La dichotomie conceptuelle φύσει-θέσει est manifestement, ici, le fait d'une construction doxographique—au mieux une transposition sémantique—, de sorte qu'il n'est pas possible de l'attribuer à Démocrite.⁵³ Ce texte n'est donc pas très concluant pour mon propos. Par ailleurs, le très elliptique fragment 68 B 267, 'par nature le commandement est propre au plus fort',⁵⁴ est d'une interprétation délicate, notamment parce qu'il est difficilement compatible avec les positions pro-démocratiques qui sont en d'autres endroits celles de Démocrite,⁵⁵ tout au moins s'il doit être pris en un sens normatif. Il ne semble pas, cependant, que la valeur normative de la référence à la nature soit dominante chez Démocrite.

En revanche, le fragment 68 B 33 ouvre des perspectives plus intéressantes: 'la nature et l'éducation sont à peu près semblables. En effet, l'éducation transforme l'homme et, en transformant, produit une nature'.⁵⁶ Dans cette dernière phrase, les formes verbales μεταρρυσμοῖ et φυσιοποιεῖ, signalent clairement l'horizon physique de la problématique et le second conduit à concevoir l'éducation comme une entreprise littéralement *poiétique*, c'est-à-dire non seulement éthique mais aussi technique. Le terme μεταρρυσμοῖ suggère en effet l'idée d'une modification du *rhythme* atomique, ῥυθμός désignant une des trois différences atomiques fondamentales.⁵⁷ L'atome lui-même ne saurait toutefois connaître de modifications et G. Vlastos, commentant ce fragment,⁵⁸ y perçoit l'indication d'un changement dans la configuration globale, la proportion ou l'arrangement des atomes de l'âme. Le *rhusmos* n'est pas ici la forme

⁵² Procl. in *Crat.* 16, 6, 10 [68 B 26].

⁵³ Comme le montre Brancacci (1986) 16–18.

⁵⁴ φύσει τὸ ἄρχειν οἰκίμιον τῷ κρείσσονι, Stob. IV 6, 19 [68 B 267].

⁵⁵ Stob. IV 1, 42 [68 B 251].

⁵⁶ ἡ φύσις καὶ ἡ διδασχὴ παραπλήσιόν ἐστι. καὶ γὰρ ἡ διδασχὴ μεταρρυσμοῖ τὸν ἄνθρωπον, μεταρρυσμοῦσα δὲ φυσιοποιεῖ, Clem. Al. *Strom.* IV 151; Stob. II 31, 65 [68 B 33].

⁵⁷ Voir notamment Aristot. *Met.* A 4. 985b4–22 [67 A 6].

⁵⁸ Vlastos (1975) 390–391.

atomique, qui est inaltérable, mais l'état ou le mouvement des atomes dans la configuration atomique concernée. La façon dont s'opère cette modification n'est pas indiquée, mais l'on peut imaginer que l'enseignement suppose une transmission de simulacres⁵⁹—peut-être ceux qui portent la voix du maître ou les dessins qu'il trace sur le sable ou sur une tablette—qui seraient de nature à *impressionner* physiquement l'âme de l'auditeur au point d'en changer les dispositions fondamentales.

Ce texte est intéressant à plusieurs titres. En premier lieu, il montre que l'initiative humaine, pédagogique et plus généralement technique, n'est pas empêchée par la Nécessité, qui exerce pourtant son hégémonie sur l'univers démocritéen. L'activité humaine jouit d'une autonomie limitée mais suffisante pour 'produire' des déterminations naturelles et elle est en ce sens partie prenante du devenir naturel.⁶⁰ L'ordre du *nomos*, et avec lui l'idée postérieure de 'seconde nature', ne s'opposent donc pas radicalement à l'ordre de la *phusis*, non seulement parce que rien n'échappe totalement à la nécessité physique, mais aussi parce que la nature laisse place, dans son propre cours, à l'intervention des lois et des usages humains. De ce point de vue, l'analyse de Naddaf convient au propos démocritéen. En effet, l'homme peut fort bien 'produire' de la nature et il n'y a pas de discontinuité entre le mécanisme initial et l'activité technique, mais plutôt une forme d'adaptation de l'homme aux contraintes et aux limites de fait imposées par la matière.⁶¹ En second lieu, la nature dont il est ici question, loin de se limiter à l'état immuable des choses, apparaît comme particulièrement plastique, susceptible de modifications et de réarrangements successifs. Elle désigne un processus ou l'ensemble des conditions d'un processus toujours inachevé et acquiert une signification fondamentalement dynamique, qu'il s'agisse de la nature 'en général' ou de la nature particulière de l'homme. Si, comme l'indique la première pro-

⁵⁹ Taylor (1999) 233.

⁶⁰ Comme me l'a fait remarquer Bernard Besnier, il est possible que *φύσιον ποιῶν* signifie 'produit comme la nature'. Cela toutefois ne modifie pas l'interprétation que je propose de ce fragment, car même si le rapport entre l'éducation et la nature est d'analogie, la première ne saurait, par principe, s'affranchir totalement des conditions générales imposées par la seconde.

⁶¹ Cette continuité se retrouve dans la conception démocritéenne de la genèse progressive des techniques sous la contrainte naturelle du besoin, d'après le témoignage de Diodor. I 8, 7 [68 B 5, 1]. De même, le fragment 68 B 154 montre le profit que les hommes ont su tirer de l'imitation des animaux, celle de l'araignée pour le tissage, de l'hirondelle pour l'architecture, du cygne et du rossignol pour la musique (Plutarch. *De sollert. anim.* 20 p. 974 A). Sur ce point, voir Morel (2003a).

position du fragment, la nature est 'à peu près semblable' à l'éducation, c'est donc parce qu'elle-même se caractérise à la fois par une stabilité relative et par un processus de modifications incessantes. Il ne s'agit pas d'une quelconque 'nature humaine', universelle et définitivement formée, mais de la situation, toujours en devenir, d'un individu qui se modifie sans cesse, au double point de vue de la nature et de la culture.⁶² La nature ainsi comprise est, si l'on veut, l'ordre des choses, mais un ordre qui n'a rien d'immuable. Le concept de φύσις ne perd donc pas chez Démocrite son sens dynamique traditionnel.

Nous rencontrons enfin plusieurs occurrences de φύσις au sens moins technique d'aptitude individuelle (IV), en association à τροφή: 'il peut y avoir de la réflexion chez les jeunes gens et de l'irréflexion chez les vieillards, car ce n'est pas le temps qui apprend à penser, mais une éducation précoce⁶³ et la nature';⁶⁴ ou en opposition à ἀσκησις: 'ceux qui deviennent bons par l'exercice sont plus nombreux que ceux qui le sont par nature'.⁶⁵ Dans le même ordre d'idées, φύσις peut aussi désigner le talent ou génie individuel, comme celui d'Homère, dont Démocrite pense qu'il est un don divin.⁶⁶ De même, Démocrite recommande à chacun de ne 'rien entreprendre qui soit au-dessus de ses propres capacités et de sa nature' (ὑπὲρ τε δύναμιν αἰρεῖσθαι τὴν ἑωυτοῦ καὶ φύσιν).⁶⁷

Au terme de ce parcours, nous constatons d'abord que la nature ne désigne pas directement le Tout, sauf dans les transcriptions doxographiques de l'idée de réserve atomique universelle. C'est là un point sur lequel les épicuriens se démarqueront des premiers atomistes. Dans la *Lettre à Hérodoté* d'Épicure, φύσις peut désigner les atomes⁶⁸—ainsi que le vide, qualifié de 'nature intangible' (ἀναφής φύσις)⁶⁹—parce qu'ils sont proprement l'essence ultime de toutes choses. Par ailleurs, le terme s'applique également à toute structure stable: aux corps composés⁷⁰

⁶² Voir en ce sens Tortora (1984) 394–396.

⁶³ Ou: 'mature development', Taylor (1999).

⁶⁴ ἔστι που νέων ξύνεσις καὶ γερόντων ἄξυνεσίη· χρόνος γὰρ οὐ διδάσκει φρονεῖν, ἀλλ' ὥρσάη τροφή καὶ φύσις, Stob. II 72 [68 B 183].

⁶⁵ πλέονες ἔξ ἀσκήσιος ἀγαθοὶ γίνονται ἢ ἀπὸ φύσιος, Stob. III 66 [68 B 242].

⁶⁶ Dio Chrysost. *Orat.* XXXVI 1 [68 B 21]. Sur ce fragment, voir l'article d'Aldo Brancacci, ci-dessous, p. 00.

⁶⁷ Stob. IV 39, 25 [68 B 3].

⁶⁸ *Ep. ad Her.* 41; 79 (implicitement).

⁶⁹ *Ep. ad Her.* 40; *Ep. ad Pyth.* 86.

⁷⁰ *Ep. ad Her.* 49; *Ep. ad Pyth.* 90.

et même à ces types d'agrégats particulièrement subtils que sont les simulacres⁷¹ d'une part, et les dieux⁷² d'autre part. Ces deux premiers sens sont du reste regroupés sous une rubrique générique, négativement définie: celle des 'choses qui sont saisies comme des *natures* complètes', et qui donc existent par soi, par opposition à leurs propriétés et à leurs accidents.⁷³ Cependant, la nature épicurienne est d'abord l'ordre général des choses, ou la totalité qu'elles constituent. Ce qui, en l'espèce, n'apparaît que de manière assez faible dans les fragments conservés de Démocrite vient au premier plan dans la sémantique épicurienne de la nature. Ainsi, 'la nature a été instruite et contrainte, abondamment et de multiples manières, par les choses elles-mêmes'⁷⁴ et c'est assurément cette entité globale qui constitue l'objet fondamental de la 'philosophie naturelle' (φυσιολογία) épicurienne, comme le confirme le paragraphe final de la *Lettre à Hérodote*, qui parle de 'la nature de la totalité des choses' et de 'l'ensemble de la nature'.⁷⁵ On sait, par ailleurs, que Lucrèce entend principalement par '*natura*' la totalité des choses. La règle de vie que dessine le *De rerum natura* se fonde ainsi sur la connaissance des 'pactes de la nature' (*foedera naturae*), c'est-à-dire sur les lois de fait—par opposition à des causes finales ou à des intentions⁷⁶—qui en régissent le fonctionnement d'ensemble.⁷⁷

L'absence relative d'une nature totale et englobante chez Démocrite, dira-t-on, n'est peut-être que le résultat contingent de la perte de la plupart des textes physiques. Elle n'est toutefois pas illogique, dans un univers sans limite, tant du point de vue du vide que du point de vue du nombre des atomes et de leurs formes. De plus, comme le montre bien le fragment 68 B 33, la *phusis* comme ordre général des choses n'est pas exclusive des institutions et des agissements humains, puisque

⁷¹ *Ep. ad Her.* 48.

⁷² *Ep. ad Her.* 78; *Ep. ad Pyth.* 113, 115.

⁷³ *Ep. ad Her.* 40. Dans le même sens, voir aussi les occurrences des §§68–69. Voir encore l'expression très générale 'la nature des êtres', au §45. 'Nature' est aussi l'équivalent de 'caractéristique propre' ou 'essence' d'une entité donnée, qu'il s'agisse d'une nature au sens physique du terme ou d'une propriété, en *Ep. ad Her.* 70–71. D'après la *Lettre à Ménécée*, nous pouvons ainsi parler de la 'nature' du plaisir (*Ep. ad Men.* 129).

⁷⁴ *Ep. ad Her.* 75.

⁷⁵ *Ep. ad Her.* 83.

⁷⁶ Ce qui n'empêche pas les épicuriens de parler des 'fins' de la nature pour évoquer ses limites de fait. Voir sur ce point Morel (2003b).

⁷⁷ Sur le sens de *natura* chez Lucrèce, et à Rome en général, voir le dossier présenté dans Lévy (1996).

ceux-ci ne sont que des modifications internes de celle-là. Parce qu'il n'y a pas de discontinuité réelle entre l'état 'naturel'—ou initial—des choses et les initiatives humaines—l'éducation ou le développement des techniques—, nous ne pouvons tracer les limites claires de ce qui relèverait de la pure nature. Une telle limite est néanmoins postulée, sur le plan éthique et sans doute pour des raisons plus pratiques que théoriques, lorsqu'il convient de distinguer l'état originel des choses de l'exercice ou de l'opinion humaine. Le terme le plus clairement englobant que nous trouvons chez Démocrite et Leucippe est celui de 'Nécessité', lorsqu'il désigne le mode général de production des événements.⁷⁸ Ce n'est pas celui de 'nature'.

On constate également que la doxographie entendue au sens large accentue l'usage technique et proprement atomique de φύσις. Or les fragments nous invitent à corriger cette image pour trois raisons. En premier lieu, ils témoignent d'une diversité sémantique que les témoignages ont tendance à gommer. En second lieu, ils reflètent, lorsqu'il s'agit d'occurrences techniques, une vision non réductionniste de la nature, puisque l'on peut parler de 'nature' à propos de structures qui ne sont identifiables qu'au niveau des composés. Enfin, ces structures n'étant elles-mêmes que des états provisoires et modifiables des agrégats atomiques, des effets d'inertie simplement constants et non pas intrinsèquement nécessaires, la *phusis* est moins l'état des choses que la façon dont celles-ci se produisent et se conservent. La nature est toujours à comprendre en un sens fondamentalement dynamique: la manière dont les choses se produisent lorsqu'elles le font avec une certaine régularité. Démocrite s'affranchit ainsi, dans la construction même du concept de nature, de la contradiction ancienne—tout au moins élatique—entre la stabilité et le devenir.

Que nous apprend finalement le concept de 'nature' sur l'objet de la philosophie naturelle de Démocrite? Si nous nous en tenons à une conclusion minimale et prudente, nous sommes tentés de dire: très peu de choses. Démocrite ferait un usage non systématisé de ce concept et nous ne pourrions rien conclure de certain sur sa *physique* à partir de son usage de φύσις. Si nous choisissons en revanche de prendre ce concept au sérieux et si nous y voyons un véritable opérateur philosophique, nous devons alors tirer la conclusion suivante. Démocrite n'est pas l'auteur d'un *Peri phuseôs* littéral, mais l'instiga-

⁷⁸ Voir ci-dessus, n. 1.

teur d'une vaste enquête sur les choses qui sont, quelle que soit la manière dont elles sont: éternellement, comme les atomes et le vide; par convention, comme les désignations linguistiques et les qualités sensibles; provisoirement, comme les composés et les dispositions psychologiques. L'idée de nature n'est pas, dans ce dispositif, un objet central. Elle est plutôt un concept transversal et relatif, qui s'applique aux atomes en tant qu'ils sont immuables, s'oppose aux faits de conventions, mais convient aux composés stabilisés et aux dispositions individuelles pour décrire leur état actuel ou leur mode de production. De toute évidence, la 'nature' démocratéenne n'a pas, à l'origine, le statut hégémonique et emblématique que lui attribueront les générations suivantes.

Démocrite est bien un philosophe de la nature, en un sens très général et commun, d'une part au sens où il traite de toutes les choses dans leur ensemble⁷⁹ et, d'autre part, au sens où il n'y a pas d'autre cause, ni finale ni providentielle, en dehors des propriétés élémentaires et des modifications des corps. Toutefois, il l'est aussi en un sens qui lui est propre, et qui est irréductible aux synthèses commodées. Nous constatons, en effet, que Démocrite a fait usage d'un même concept pour désigner aussi bien les atomes que la structure des composés apparents, l'ordre habituel et général des choses ou le génie individuel. La nature, en un mot, désigne toujours une forme de stabilité dans le cours même du devenir: soit un état permanent (la nature propre des atomes), soit une structure précaire mais relativement constante (les composés; les dispositions du caractère). Ce constat n'est pas sans conséquences: il invite indirectement à préciser les termes dans lesquels il faut comprendre la coupure ontologique, si souvent soulignée dans les témoignages et dans plusieurs fragments bien connus, entre d'une part le niveau des principes élémentaires—les atomes et le vide—et d'autre part celui des structures de second ordre et des qualités perceptibles. Cette coupure est réelle, même si elle doit être nuancée, au moins sur le plan méthodologique, lorsqu'il s'agit de définir des 'étiologies' particulières. Toutefois, le concept de φύσις n'est pas sur ce point déterminant, parce qu'il n'est pas, si l'on considère l'ensemble des textes conservés, un concept ontologiquement discriminant. C'est

⁷⁹ Selon Long (1999), il s'agit-là d'un trait caractéristique de l'ensemble des philosophes présocratiques. Pour Démocrite, voir l'ensemble de témoignages rassemblés par Diels-Kranz sous le n° 68 B 165.

précisément par ce biais qu'il manifeste, à sa manière, l'unité relative de la philosophie démocritéenne de la nature. Il témoigne aussi de la richesse et de la diversité de registres qui caractérise le discours de Démocrite et son projet philosophique.⁸⁰

⁸⁰ Je tiens à remercier pour leurs utiles remarques les participants et les intervenants du colloque de Paris, en particulier B. Besnier, C. Lévy, W. Leszl. Je remercie également Miriam Campolina D. Peixoto pour les suggestions qui m'ont été faites lors de la conférence que j'ai donnée sur ce thème à Belo Horizonte.

PERCEPTION ET CONNAISSANCE CHEZ DÉMOCRITE

JEAN SALEM

On s'efforcera d'étudier ici la théorie démocratéenne de la perception et les diverses questions qu'elle nous pose: y aurait-il eu *deux* versions de la théorie des simulacres? comment, selon cette même théorie, la distance et la taille des objets peuvent-elles être perçues? en quel sens la sensation implique-t-elle une altération de celui qui sent? (§1). Passant à la théorie de la connaissance, on constatera avec quelle insistance, certains interprètes, outrepassant les déclarations pourtant fort explicites de Sextus, ont voulu présenter Démocrite comme un ancêtre de Pyrrhon (§2 et 3). Je préfère de beaucoup souligner, pour ma part, le rôle essentiel que Démocrite a attribué à l'expérience empirique, quitte à faire état d'une 'double approche du réel', – la connaissance légitime venant rectifier, ou même, le cas échéant, renverser, les premières informations qui ont été délivrées par les sens (§4). Et je remarquerai enfin que les mathématiques démocratéennes paraissent avoir péché par *excès* d'empirisme: loin de considérer avec Philolaos que la géométrie est le principe et la patrie de toutes les sciences,¹ Démocrite a, somme toute, ravalé cette discipline au rang de sous-partie de la physique, réduisant ainsi le domaine de la mathématique pure à celui de l'arithmétique (§5).

1. *Théorie de la perception*

Si, du point de vue de la *ratio essendi*, c'est le toucher qui, chez les Atomistes, constitue le sens auquel se ramènent tous les autres, c'est la vue qui, dans l'ordre de la *ratio cognoscendi*, leur inspire les développements les plus détaillés et les explications les plus amples: Lucrèce, en son

¹ Plutarch. *Quaest. conv.* VIII 2, 1 p. 718 E [44 A 7a]: γεωμετρία κατὰ τὸν Φιλόλαον ἀρχὴ καὶ μητρόπολις... τῶν ἄλλων (μαθημάτων); pour la trad. franç., cf. Dumont (1988) 491.

chant IV, consacrerait près de 500 vers à étudier la vision sensorielle;² Épicure, dans la *Lettre à Hérodoté*, en parlerait, pareillement, beaucoup plus que des autres sens.³ — Étudier l'explication que Démocrite a pu fournir du mécanisme de la perception visuelle présente pourtant d'emblée une difficulté: nous disposons, en effet, non point d'une, mais de *deux* versions différentes de la théorie des simulacres. Ou bien (comme c'est le cas chez Alexandre d'Aphrodise et Aétius), l'on nous dit qu'il a estimé, 'ainsi que Leucippe avant lui et Épicure après lui, que certains simulacres (εἰδωλα), qui se détachent continuellement des objets visibles et qui ont la même forme qu'eux, pénètrent dans les yeux [de ceux qui voient] et engendrent ainsi la vision'⁴ (voir consisterait donc, selon cette première théorie, à 'recevoir l'impression visuelle en provenance des objets vus').⁵ Ou bien (et c'est là ce que paraît rapporter Théophraste), l'œil lui-même projette des rayons au-devant des objets, dont l'image se forme au point de rencontre du simulacre et du flux visuel. Selon Théophraste, en effet, Démocrite aurait enseigné que 'l'image ne se produit pas directement dans la pupille', mais que 'l'air situé dans l'intervalle entre la vue et l'objet vu est comprimé et frappé par l'objet visible et l'œil qui voit, étant donné que toute chose émet toujours quelque effluve. Ensuite cet air, qui est un solide de couleur différente, produit une image qui se réfléchit dans les yeux humides'.⁶ Il existerait donc, dans ce dernier cas, des effluves de toutes choses, *y compris de l'œil lui-même*, et celles provenant de l'œil et de l'objet vu se rencontreraient quelque part, dans l'air intermédiaire, non sans comprimer celui-ci et le

² Dans le poème *De la nature*, les vers 26 à 461 du chant IV ont trait à la théorie des simulacres et à l'infailibilité des sensations visuelles; les sens autres que la vue sont étudiés beaucoup plus rapidement.

³ Cf. Epicur. *Ep. ad. Her.* 46 à 51; l'audition et l'olfaction sont traitées, beaucoup plus vite, aux §52 et 53 de la même *Lettre*.

⁴ Alex. Aphr. *De sens.* 24.14 [67 A 29]: ἡγεῖται δὲ αὐτὸς τε καὶ πρὸ αὐτοῦ Λ. καὶ ὕστερον δὲ οἱ περὶ τὸν Ἐπίκουρον εἰδωλὰ τινα ἀπορρέοντα ὁμοίωμαρτα τοῖς ἀφ' ὧν ἀπορρεῖ (ταῦτα δὲ ἐστὶ τὰ ὀρατὰ) ἐμπέπτειν τοῖς τῶν ὀρώντων ὀφθαλμοῖς καὶ οὕτως τὸ ὄραν γίνεσθαι. — Nous suivons pour ce témoignage la traduction donnée par M. Solovine; cf. Morel (1993), 119.

⁵ Alex. Aphr. *De sens.* 24.14 [67 A 29]. — C'est une 'introduction des simulacres' (κατὰ εἰδῶλων εἰσχωρίων), rapporte, dans le même sens, Aétius, qui, chez Leucippe, Démocrite et Épicure [...] produit l'affection de la vue' (Aet. IV 13, 1 [67 A 29]).

⁶ Theophr. *De sens.* 50 [68 A 135] (trad. Dumont (1988) 809): τὴν γὰρ ἔμφασιν οὐκ εὐθὺς ἐν τῇ κόρῃ γίνεσθαι, ἀλλὰ τὸν ἀέρα τὸν μεταξὺ τῆς ὄψεως καὶ τοῦ ὀρωμένου τυποῦσθαι συστελλόμενον ὑπὸ τοῦ ὀρωμένου καὶ τοῦ ὀρώντος· ἀπαντος γὰρ αἰεὶ γίνεσθαι τινα ἀπορροήν· ἔπειτα τοῦτον στερεὸν ὄντα καὶ ἀλλόχρων ἐμφαίνεσθαι τοῖς ὀμμασιν ὕγρασις.

solidifier;⁷ au point que Démocrite aurait comparé l' 'empreinte' ainsi produite sur l'air (ἀποτύπωσις)⁸ à celle que fait 'un sceau sur la cire'.⁹

C'est, à ce qu'il semble, Alcméon de Crotone qui, avant beaucoup d'autres, avait soutenu ce point de vue de la *double émission*. Les yeux, selon ce pythagoricien, 'contiennent du feu'; il en voulait pour preuve qu' 'un choc [sur l'œil] provoque des étincelles', ἐκλάμπειν.¹⁰ Empédocle et, plus tard, Platon également furent sur ce point tous deux débiteurs d'Alcméon. Empédocle enseigne que l'œil se comporte à la manière d'une 'lanterne' (λύχνος), dont le feu illumine les ténèbres.¹¹ 'De tout être engendré, déclare-t-il, sont émis des effluves' (ἀπορροαί), – non seulement des animaux, des plantes, de la terre et de la mer, mais aussi des pierres, des bronzes et du fer.¹² Continûment, 'quelque chose s'écoule et s'en va d'elles'.¹³ Et Platon soutient que les dieux 'ont fait en sorte que le feu pur qui réside au dedans de nous et qui est frère du feu extérieur, s'écoulât à travers les yeux de façon subtile et continue': de la sorte, 'il rencontre et choque celui qui provient des objets extérieurs'.¹⁴

J'ai constaté, après Luria,¹⁵ qu'il n'y a pas de raison bien solide pour récuser l'idée que Démocrite aura professé là-dessus une *unique* théorie; et celle-ci paraît bien avoir consisté à soutenir que ce ne sont pas les

⁷ Theophr. *De sens.* 50 [68 A 135]: τοῦτον στερεόν.

⁸ Theophr. *De sens.* 50 [68 A 135].

⁹ Theophr. *De sens.* 51 [68 A 135]: ὥσπερ καὶ αὐτὸς λέγει παραβάλλων τοιαύτην εἶναι τὴν ἐντύπωσιν οἷον εἰ ἐκμάξιαις εἰς κηρόν. — Cf. Theophr. *De sens.* 52 (trad. Dumont (1988) 810): 'l'air se trouve modelé à la façon dont la cire est pressée et comprimée'.

¹⁰ Theophr. *De sens.* 26 [24 A 5]. — Cf. également, dans ce même texte: 'pour qu'il y ait vision, il faut quelque chose de brillant et, face à lui, quelque chose de transparent qui émette soi-même de la lumière'.

¹¹ Cf. Aristot. *De sens.* 2. 437b26 [31 B 84]. — Un problème d'interprétation analogue à celui qui nous occupe ici se pose d'ailleurs à la lecture des témoignages concernant Empédocle: ainsi Aristote déclare-t-il que ce philosophe 'explique l'acte de voir', tantôt (ὅτε) en soutenant que nous voyons 'par une lumière issue de l'œil', tantôt (ὅτε) 'par les émanations qui émanent des objets de la vue' (Aristot. *De sens.* 2. 437b23–25 et 438a4–5).

¹² Plutarch. *Quaest. nat.* 19 p. 916 D [31 B 89].

¹³ Plutarch. *Quaest. nat.* 19 p. 916 D [31 B 89]: καὶ γὰρ φθίρεται πάντα καὶ ὀλωλε τῷ ὄειν αἰεὶ τι καὶ φέρεσθαι συνεχῶς.

¹⁴ Cf. Plat. *Tim.* 45 C–D (trad. A. Rivaud; Paris, Les Belles Lettres, 1970, p. 162); cf. également: *Theaet.* 156 D. — Quant à Hipparque (Aet. IV 13, 9–10), il soutint que 'les rayons émis par les deux yeux vers les contours des objets les saisissent comme avec des mains'.

¹⁵ Cf. Salem (2002²) 131–132; ainsi que: Luria (1970) II, *ad* n° 477, Rem. 2.

images qui frappent l'œil, mais les empreintes qu'elles impriment dans l'air. Rien, en effet, ne nous oblige à penser que Démocrite aurait été le premier à renoncer à la théorie de la double émission. Il est, d'ailleurs, très remarquable que, pour ce qui est de l'*audition*, Aétius paraît distinguer de façon suffisamment nette *deux* théories qui, comme le remarque Guthrie, 'forment un parallèle avec celles de la vue':¹⁶ or la première, qui rend compte du son par l'existence d'un flux d'atomes provenant directement du corps sonore jusqu'à l'oreille, est attribuée *au seul Épicure*; tandis que Démocrite, nous dit-on, 'déclare que l'air aussi, καὶ τὸν ἀέρα, est émietté en corps de figures semblables et emporté dans le flot des éclats de voix'.¹⁷ Il semble donc bien que la théorie démocritéenne de la perception incluait cette 'étape intermédiaire'¹⁸ que les épicuriens ont eu, par la suite, tout intérêt à rejeter, car ils souhaitaient accréditer, pour leur part, l'idée que la sensation constitue le transfert partiel et instantané de l'objet en nous. Tout se passe donc comme si nous avions affaire, dans le cas de la vue, d'une part, à une version 'détaillée', que présente et critique Théophraste, et, d'autre part, à une version, pour le moins 'simplifiée' de l'enseignement démocritéen:¹⁹ cette version schématique et sommaire, contaminée par les thèses d'Épicure, aurait suscité les témoignages approximatifs d'Aétius et d'Alexandre d'Aphrodisie.²⁰ Et l'on pourrait peut-être en discerner les prodromes jusque dans certaines formules particulièrement lapidaires, auxquelles recourt l'exposé de Théophraste lui-même.²¹

¹⁶ Guthrie (1990²) II, 447.

¹⁷ Cf. Aet. IV 19, 13 [68 A 128] (trad. Dumont (1988) p. 806): Δ. καὶ τὸν ἀέρα φησὶν εἰς ὁμοιοσχήμονα θρύπτεσθαι σώματα καὶ συγκαλινδεῖσθαι τοῖς ἐκ τῆς φωνῆς θραύσμασι. — Diels ne cite que la fin du passage.

¹⁸ Guthrie (1990²) II, 447.

¹⁹ Nous reprenons ici les termes mêmes qu'a employés P.-M. Morel; cf. son excellent ouvrage, intitulé *Démocrite et la recherche des causes*, Morel (1996) 233, 235. — R. Baldes, a supposé que l'air ici évoqué est celui qui borde immédiatement la pupille: cela revient à tenir pour quantité négligeable la thèse selon laquelle 'toute chose émet toujours quelque effluve', Theophr. *De sens.* 50 [68 A 135], et à considérer que c'est la version *simplifiée* (de type épicurien) qui est la bonne; cf. Baldes (1975a) 93–105, ainsi que la critique tout à fait fondée de son interprétation, in Morel (1996) 227 n. 181 et 230 n. 193.

²⁰ Cf. ci-dessus, p. 126, ainsi qu' à la même page les n. 5 et 6.

²¹ Cf. par ex. Theophr. *De sens.* 50 [68 A 135], Dumont (1988) 809: 'la vue est *produite*, selon Démocrite, par l'image reflétée', ὁρᾶν μὲν οὖν ποιεῖ τῇ ἐμφάσει; ou bien encore, au §80 (trad. Dumont (1988) 819): 'voir, déclare-t-il, se fait au moyen de l'effluve et de l'image reflétée sur l'œil', ὁρᾶν δὲ φησι διὰ τὴν ἀπορροήν καὶ τὴν ἔμφασιν τὴν εἰς τὴν ὄψιν. — Cf. également, Aristot. *De sens.* 2, 438a6–7; in *Parv. nat.* (trad. J. Tricot), Paris, Vrin, 1951: Démocrite 'pense que la vision n'est que le reflet (ἔμφασις) d'un objet, sur ce point il a tort'.

Nous pouvons maintenant nous demander quelles étaient, selon Démocrite, les conditions physiologiques de l'acuité visuelle, ainsi que celles qui lui ont paru nécessaires à l'efficacité des autres organes sensoriels. On relèvera d'une part, concernant le sens de la vue, qu'une grande quantité de feu et de chaleur (autrement dit, *d'atomes mentaux*, c'est-à-dire d'atomes petits, lisses et sphériques, agités d'un mouvement perpétuel et portés pour cette raison au degré de chaleur extrême qui est indispensable à l'entretien de la vie et de l'intelligence) permet aux yeux qui en sont pourvus de bien voir.²² Et, de même qu'Empédocle avait assigné à l'eau un rôle presque aussi important que celui du feu dans l'explication qu'il avait donnée de la vision oculaire,²³ de même Démocrite assure-t-il que les images s'impriment par privilège sur l'*humide*, τὸ ὑγρὸν, qui les 'laisse pénétrer', διέναι.²⁴ À l'inverse, ce qui est dense, τὸ πυκνόν, c'est-à-dire un œil excessivement sec, ne les reçoit pas.²⁵

R.W. Baldes a considéré, par ailleurs, que l'on peut pas raisonnablement prêter à l'Abdérain la thèse selon laquelle les images subiraient, durant leur cheminement au travers de l'air, une réduction de leurs dimensions, laquelle serait proportionnelle à la longueur du parcours que ces images effectuent avant de pénétrer dans nos yeux.²⁶ Démocrite paraît, plus précisément, avoir attribué à l'*air* le rôle d'intermédiaire qu'Aristote réserve, pour sa part, au 'diaphane'. Et, malgré la subtile analyse de D. O'Brien, nous ne pensons pas qu'il y ait, dans ce dernier commentaire, un risque d' 'assimilation abusive de la doctrine démocratéenne à celle d'Aristote'.²⁷ Selon cet auteur, en effet, on aurait tort de se figurer que l'air est un *intermédiaire* obligé et d'éliminer de la théorie démocratéenne 'tout contact direct' entre les émanations issues de l'ob-

²² Cf. Salem (2002²) 133–135.

²³ Cf. Theophr. *De sens.* 8 [31 A 86] (trad. Dumont (1988) 364): 'La vue la mieux mélangée et la meilleure est celle qui est composée des deux éléments [*sc.* le feu et l'eau] en quantité égale'.

²⁴ Theophr. *De sens.* 50 [68 A 135]. — Cf. Aristot. *De sens.* 2. 438a10–12; in *Parv. nat.* (trad. J. Tricot): 'Il est étrange', se demande Aristote, 'qu'il ne lui soit pas venu à l'idée de se demander pourquoi l'œil seul voit, à l'exclusion des autres objets dans lesquels les simulacres sont réfléchis'. Démocrite aurait probablement répondu que si les lacs, les fleuves et les mers ne voient pas (bien qu'ils réfléchissent les simulacres, eux aussi), c'est que ces composés-là sont inanimés, c'est-à-dire qu'ils ne contiennent pas, à la différence des vivants, une proportion de sphéroïdes suffisamment élevée.

²⁵ Theophr. *De sens.* 50 [68 A 135].

²⁶ Baldes (1975b) 42–44.

²⁷ O'Brien (1984) 43.

jet et les yeux.²⁸ Je continuerai de croire, cependant, avec la majorité des commentateurs, que l'air, chez Démocrite, a bien pour effet d'affecter les émanations, au cours de leur trajet entre l'objet et l'œil;²⁹ l'air ou, plus exactement, l'action de l'air, combinée à celle des rayons solaires.³⁰

En outre, je crois avoir trouvé, dans le *De Sensu* d'Aristote, la preuve de ce que, bien avant Épicure, Démocrite a non seulement reconnu l'existence d'un *minimum* sensible, mais celle, aussi, d'un *minimum* de temps continu, c'est-à-dire d'un instant sensible, d'un laps de temps si court qu'il n'est pas susceptible, pour nous, d'interruption.³¹ Ce dogme a partie liée, notamment, avec la théorie démocritéenne des couleurs dont il faut dès à présent dire deux mots.

Démocrite aurait enseigné qu'il y a *quatre* couleurs 'pures', ἀπλᾶ, ou fondamentales: le blanc, le noir, le rouge et le vert.³² Et chacune de ces couleurs serait 'd'autant plus pure qu'elle est formée de figures moins mêlées [à d'autres figures]'.³³ Il a identifié 'le noir avec le rugueux, et le blanc avec le lisse', déclare Aristote.³⁴ Car la sensation du blanc (λευκόν) est selon lui provoquée par des atomes lisses: ceux-ci sont séparés par de larges pores, quand la blancheur du corps composé semble associée

²⁸ O'Brien (1984) 43. — W. Burkert a soutenu, pour sa part, le point de vue suivant: selon Démocrite, la vision normale ferait intervenir les 'empreintes' formées avec le concours de l'air; tandis que les images ou simulacres rendraient compte des phénomènes parapsychologiques; cf. Burkert (1977) 97–109. Langerbeck, avait déjà voulu croire, en son temps, que la doctrine des εἶδωλα ne concerne pas la théorie de la connaissance mais seulement la démonologie: Alfieri (1936) 303 a fait cependant observer, qu'il est fort difficile de croire que Démocrite ne désigne pas les ἐμφάσεις, elles aussi, lorsqu'il use du mot εἶδωλα (cf. par ex. Aet. V 2, 1 [68 A 136]).

²⁹ Cf. en partic.: Mullach (1843) 402; Haas (1907) 371 et *passim*; Lackenbacher (1913) 50; Sassi (1978) 106–109.

³⁰ Cf. Theophr. *De sens.* 54 [68 A 135]: 'le Soleil, comme il le déclare, en repoussant l'air loin de lui et en le frappant, le condense...'

³¹ Cf. Aristot. *De sens.* 2. 440a16–23.

³² Theophr. *De sens.* 73–75 [68 A 135]. — Aétius parle, lui, du blanc, du noir, du rouge et du *jaune* (ὀχρόν); cf. Aet. I 15, 8 [68 A 125]. Sans doute y aura-t-il eu confusion, chez lui, avec la *palette* empédocléenne, laquelle, nous dit-il par ailleurs, se compose précisément des quatre couleurs que l'on vient de citer; cf. Aet. I 15, 3 [31 A 92].

³³ Theophr. *De sens.* 76 [68 A 135] (trad. Dumont (1988) 818).

³⁴ Aristot. *De sens.* 4. 442b10–12 [68 A 126]. — Cf. également saint Thomas, *In Aristotelis libros de Sensu et Sensato, de Memoria et Reminiscentia Commentarium*, éd. A. Pirotta, Turin, 1928, 59, 156: 'Démocrite dit que le blanc est le lisse (*laeve*), et considère que l'éclat du blanc (*claritas albi*) provient de ce qu'il est illuminé en totalité, du fait que ses parties sont disposées de manière égale'.

à une certaine dureté; ils sont arrondis, juxtaposés très uniformément, et n'ont, entre eux, qu'une petite surface de contact, lorsque l'objet blanc apparaît friable.³⁵ Le noir (μέλαν) résulte d'atomes aux formes rugueuses et irrégulières, qui projettent de minuscules ombres, ainsi que de pores contournés, dans lesquels la lumière ne peut pénétrer que malaisément.³⁶ Le rouge (ἐρυθρόν) se caractérise, lui, par 'des figures de même sorte que celles dont le chaud est formé, sauf qu'elles sont plus grandes'.³⁷ Le vert (χλωρόν), enfin, 'est formé à la fois de solide et de vide mélangés, la nuance (τὴν χροάν) variant selon la position et l'ordre' des pleins et des creux.³⁸ Nous pouvons donc supposer, à partir de là, que la couleur varie suivant la façon dont les atomes et les espaces interstitiels réfléchissent, absorbent ou laissent pénétrer la lumière qui se déverse sur eux.³⁹ Du mélange de ces quatre couleurs primaires,⁴⁰ lesquelles, comme eût pu le dire Novalis, sont les 'consonnes de la lumière' (*die Lichtkonsonanten*),⁴¹ dérivent toutes les autres couleurs,⁴² qui sont en nombre illimité.⁴³

Aristote reproche donc à Démocrite d'avoir supposé l'existence de temps minuscules et imperceptibles, afin de mieux faire admettre que la perception d'une couleur composée résulte de la juxtaposition de plusieurs perceptions élémentaires correspondant chacune à une couleur simple.⁴⁴ Qui perçoit de l'indigo *hic et nunc* devra convenir en effet, selon les vues de Démocrite, qu'il a été impressionné, d'une part, par des flux d'atomes dont la forme provoque en nous la sensation du rouge et, d'autre part, par des flux d'atomes dont la forme provoque en nous la sensation du bleu. Partant, il lui faudra nécessairement supposer que ces différents *stimuli* se sont *succédé*, en un temps très bref que n'ont pas pu décomposer ses sens trop grossiers. Il lui faudra donc concéder par surcroît qu'en deçà de l'instant sensible existent à tout le moins *deux*

³⁵ Theophr. *De sens.* 73 [68 A 135].

³⁶ Theophr. *De sens.* 74. — Cf. à ce propos, l'étude fort précise de Baldes (1978) 87–100.

³⁷ Theophr. *De sens.* 75 [68 A 135] (trad. Dumont (1988) 817).

³⁸ Theophr. *De sens.* 75 [68 A 135] (trad. Dumont (1988) 818).

³⁹ Cf. Guthrie (1990²) II, 445.

⁴⁰ Cf. Theophr. *De sens.* 79 [68 A 135]: τὰς ἀρχάς.

⁴¹ Novalis, *Une suite de fragments* (1798); in *Fragments* (choisis et traduits par A. Guerne), Paris, Aubier Montaigne, 1973, 100–101.

⁴² Theophr. *De sens.* 76 [68 A 135]: τὰ δὲ ἄλλα κατὰ τὴν τοῦτων μίξιν.

⁴³ Theophr. *De sens.* 78 [68 A 135]: ἅπειρα δὲ εἶναι... τὰ χρώματα.

⁴⁴ Cf. Salem (1998) 159–169.

segments différents du temps, correspondant chacun à la production de l'un de ces deux *stimuli*.⁴⁵

Il faut enfin noter que le goût, sens subjectif par excellence, pose un problème bien moindre chez Démocrite que ce ne sera le cas dans l'épicurisme: Démocrite n'enseigne nullement, en effet, que tous les sensibles sont vrais. Et la sensation, si elle constitue une altération de celui qui sent, ne paraît pas bouleverser notre constitution atomique au point de rendre indéchiffrable ce dont elle constitue le signe: ce qui apparaît demeure constamment l'apparaître d'un être, et cet être est bel et bien celui des atomes (et du vide). 'Phénomène', chez Démocrite, ne signifie pas 'apparence', mais, bien plutôt '*apparition*': apparition, certes, fantastique et, par conséquent, déformée du réel, mais aussi *Janus bifrons*, à l'aide duquel nous prenons une première connaissance de la taille, de la forme, de la solidité, de la dureté et d'autres propriétés qui ont partie liée avec l'être suprêmement réel des atomes.

2. Aristote contre Sextus?

Touchant la position qu'adopta Démocrite en matière de théorie de la connaissance, on a pris coutume de mettre en avant l'apparente disparité des thèses qui nous ont été rapportées là-dessus. Les difficultés tiennent, au premier chef, à la question de savoir ce que fut l'appréciation de l'Abdéritaire au sujet du statut ontologique des phénomènes (τὰ φαινόμενα) ou, autrement dit, des 'sensibles' (τὰ αἰσθητά), et, corrélativement, du degré de fiabilité qu'ils ont revêtu à ses yeux. Car, d'une part, nous lisons, dans le traité *De la génération et de la corruption* d'Aristote, que Démocrite et Leucippe estimaient que 'le vrai est dans les phénomènes',⁴⁶ ce que confirme le traité *De l'Âme*,⁴⁷ et Philopon, en commentant ce dernier ouvrage évoque, lui aussi, par trois fois, l' 'identité

⁴⁵ Cf. Aristot. *De sens.* 2. 440a16–23; in *Parv. nat.* (trad. J. Tricot), 17–18: 'dans la théorie de la juxtaposition, assure Aristote, de même que nous devons nécessairement admettre une grandeur invisible (μέγεθος... ἀόρατον), ainsi devons-nous postuler également un temps imperceptible (χρόνον ἀναίσθητον), de façon à expliquer que l'arrivée successive des mouvements passe inaperçue et qu'ils donnent l'impression de l'unité, du fait qu'ils apparaissent en même temps' (ἵνα λάθωσιν αἱ κινήσεις ἀφικνούμεναι καὶ ἐν δοκῇ εἶναι διὰ τὸ ἅμα φαίνεσθαι). — Ce passage est partiellement repris dans le recueil de Luria (1970) II, 270–271, n° 282.

⁴⁶ Aristot. *De gen. et corr.* I 1. 315b9–10 [67 A 9]: ἐπεὶ δ' ὥιοντο τὰληθές ἐν τῷ φαίνεσθαι...

⁴⁷ Aristot. *De an.* I 2. 404a28–29 [68 A 101]: τὸ γὰρ ἀληθές εἶναι τὸ φαινόμενον. —

du vrai et de la représentation phénoménale' chez Démocrite.⁴⁸ Mais, d'autre part, Sextus Empiricus déclare, tout au contraire, que ce même Démocrite 'abolit les phénomènes qui concernent les sens (ἀναιρεῖ τὰ φαινόμενα ταῖς αἰσθήσεσι), et pense qu'aucun phénomène n'apparaît conformément à la vérité, mais seulement conformément à l'opinion'.⁴⁹ Seule mériterait d'être tenue pour vraie (ἀληθές) d'après le même texte, la réalité des atomes et du vide: 'Convention que le doux, dit-il en effet, convention que l'amer, convention que le chaud, convention que le froid, convention que la couleur; et en réalité: les atomes et le vide'.⁵⁰ Le doux, l'amer, le chaud, le froid, ou le blanc et le noir, bref, tout ce qui est, pour tous, phénomène (ἄλλο τι τῶν πᾶσι φαινομένων), il n'y a là, lisons-nous dans un autre passage de Sextus, que des 'noms pour nos affections' (παθῶν γὰρ ἡμετέρων ἦν ὀνόματα ταῦτα).⁵¹ Aétius prétend, dans le même sens, que, selon Leucippe, Démocrite et Diogène, 'rien de vrai n'existe et n'est saisissable (καταληπτόν) en dehors des éléments premiers: atomes et vides';⁵² Leucippe aurait même enseigné que 'toutes choses existent selon l'imagination et l'opinion, et pas du tout selon la vérité, mais au contraire apparaissent à la façon dont on voit la rame [brisée] dans l'eau'.⁵³ Faudra-t-il donc conclure, avec Marx, qu' 'il est difficile de dégager le jugement que Démocrite porte sur la vérité et la certitude du savoir humain', parce qu' 'en vérité, ce sont les vues de Démocrite qui se contredisent' elles-mêmes?⁵⁴—Sans doute pas. Je relève tout d'abord, avec Helene Weiss, que l' 'abîme' — si tant est qu'il

Cf. également: *Met.* Γ 5. 1009b15 et *passim*: τὸ φαινόμενον κατὰ τὴν αἴσθησιν ἔξ ἀνάγκης ἀληθές εἶναι φαίνεται.

⁴⁸ Philop. *De an.* 71. 19 [68 A 113]: ἀντικρυς γὰρ εἶπεν ὅτι τὸ ἀληθές καὶ τὸ φαινόμενον ταῦτόν ἐστι.

⁴⁹ Sext. Emp. *Adv. math.* VII 135 [68 B 9] (trad. Dumont (1988) 845).

⁵⁰ Sext. Emp. *Adv. math.* VII 135 [68 B 9] (trad. Dumont (1988) 845): 'νόμῳ' γὰρ φησι 'γλυκύ, [καὶ] νόμῳ πικρόν, νόμῳ θερμόν, νόμῳ ψυχρόν, νόμῳ χροῖ, ἔτεῃ δὲ ἄτομα καὶ κενόν'.

⁵¹ Sext. Emp. *Adv. math.* VIII 184–185. — À ce propos, H. Joly va jusqu'à écrire que 'les qualités ne sont que des *conventions de langage* et des commodités d'expression'; cf. Joly (1984) 263.

⁵² Aet. IV 9, 8 [67 A 32] (trad. Dumont (1988) 744). Les sensibles, lit-on dans le même texte, n'existent pas, d'après ces trois auteurs, par nature (φύσει), mais seulement par convention (νόμῳ).

⁵³ Epiphanius *Adv. haer.* III 2, 9 [67 A 33] (trad. Dumont (1988) 745): κατὰ φαντασίαν δὲ καὶ δόκησιν τὰ πάντα γίνεσθαι καὶ μηδὲν κατὰ ἀλήθειαν, ἀλλ./' οὕτω φαίνεσθαι κατὰ τὴν ἐν τῷ ὕδατι κόπην.

⁵⁴ Marx, *Doktordissertation* (1841) I, 3: ...sondern Demokrits Ansichten widersprechen sich; trad. franç. M. Rubel (1982): III, 24.

y en ait un! – ne se réduit pas à l’opposition du témoignage de Sextus et de celui que fournit, de son côté, Aristote: car on pourrait prétendre, aussi bien, qu’il traverse et disloque jusqu’au compte rendu du seul Aristote.⁵⁵ Non seulement son disciple et successeur Théophraste insiste sur l’absence de ‘réalité naturelle’, par exemple, du froid et du chaud, ainsi que sur le fait qu’une même et unique saveur peut produire, en fonction des individus ou des circonstances, des sensations tout à fait différentes,⁵⁶ mais lui-même, Aristote, déclare expressément, et en plusieurs endroits, qu’aux yeux des atomistes, ‘par nature, il n’existe pas de couleur’,⁵⁷ ou bien que les saveurs sont par eux réduites aux figures,⁵⁸ que le phénomène, par conséquent, n’est pas aussi *vrai* que pourrait le croire un empirisme naïf.

Je crois qu’il convient de se demander, d’autre part, comment de ce que Démocrite a tenu la connaissance sensible pour une connaissance seulement ‘bâtarde’, on en est venu, chez beaucoup de commentateurs, à considérer (indûment) qu’il nous conseille de traiter uniformément le sensible... comme s’il était faux. ‘Dans ses *Canons*’, écrit en effet Sextus Empiricus (IIe–IIIe siècles ap. J.-C.), Démocrite ‘déclare qu’il existe deux connaissances, l’une due aux sens, l’autre à l’intellect; à celle due à l’intellect, il donne le qualificatif de légitime, en lui accordant crédit pour juger de la vérité; à celle due aux sens, il donne le nom de bâtarde, en lui ôtant l’infailibilité dans le discernement du vrai. Il dit (je cite): Il est deux formes de connaissance, l’une légitime, l’autre bâtarde. De la bâtarde relèvent tout ensemble la vue, l’ouïe, l’odorat, le goût, le toucher. En revanche, la légitime en est distincte’.⁵⁹ Il s’agit pour nous de statuer sur le sort des enfants naturels! Donnerons-nous, en l’occurrence, nos suffrages à un statut d’Ancien régime (rien ne nous oblige envers eux, et il est même loisible de dénier à ces malheureux la moindre ressemblance avec nous), ou bien préférons-

⁵⁵ Weiss (1938) 50.

⁵⁶ Theophr. *De sens.* 63 et 67 [68 A 135]: καὶ τοῦτο διὰ τὸ αὐτὸ τὰναντία.

⁵⁷ Aristot. *De gen. et corr.* I 2. 316a1–2 [68 A 123]: διὸ καὶ χροῖαν οὐ φησιν εἶναι.

⁵⁸ Aristot. *De sens.* 4. 442b11 [68 A 126]: εἰς δὲ τὰ σχήματα ἀνάγει τοὺς χυμούς.

⁵⁹ Sext. *Emp. Adv. math.* VII 138 [68 B 11] (trad. Dumont (1988) 846): ἐν δὲ τοῖς Κανόσι δύο φησὶν εἶναι γνώσεις· τὴν μὲν διὰ τῶν αἰσθήσεων τὴν δὲ διὰ τῆς διανοίας, ὣν τὴν μὲν διὰ τῆς διανοίας γνησίην καλεῖ προσημαρτυρῶν αὐτῇ τὸ πιστὸν εἰς ἀληθείας κρίσιν, τὴν δὲ διὰ τῶν αἰσθήσεων σκοτίην ὀνομάζει ἀφαιρούμενος αὐτῆς τὸ πρὸς διάγνωσιν τοῦ ἀληθοῦς ἀπλανές. λέγει δὲ κατὰ λέξιν· ‘γνώμης δὲ δύο εἰσὶν ἰδέαι, ἡ μὲν γνησίη, ἡ δὲ σκοτίη· καὶ σκοτίης μὲν τάδε σύμπαντα, ὄψις, ἀκοή, ὄσμη, γεῦσις, ψαῦσις. ἡ δὲ γνησίη, ἀποκεκριμένη [leçon généralement acceptée, quoiqu’elle ne soit celle que de deux manuscrits] δὲ ταύτης’.

nous, pour les connaissances dues aux sens, un statut plus conforme à la loi de brumaire an II, qui proclama le principe de l'égalité des enfants naturels et des enfants légitimes? Devrons-nous tenir Démocrite pour un précurseur de Pyrrhon, et cautionner sans autre forme de procès, l'intérêt soutenu que lui porte Sextus, — en considérant que son enseignement conduit 'inévitablement' au 'pessimisme gnoséologique';⁶⁰ les sens, autrement dit, ne nous seraient-ils rien autre chose que des maîtres d'erreur et de fausseté? Ou convient-il, tout à l'inverse, de se rendre à cette évidence: la 'bâtardise' n'est jamais qu'une espèce quelque peu oblique de la filiation; et, dans ce cas, Cyril Bailey aura peut-être eu raison de soutenir que, chez Démocrite (comme chez Épicure, quoique de façon plus subtile), 'la connaissance des réalités ultimes par l'esprit doit être fondée sur la connaissance des *choses* par les sens' et qu'elle résulte, tout compte fait, d'une 'inférence' menée à partir de ceux-ci.⁶¹ Au physique comme au moral, la bâtardise n'est-elle pas le fait d'une hybridation, le produit d'un douloureux métissage, qui unit, en un singulier mariage, des caractères dont les porteurs, d'ordinaire, ne se *croisent* pas? C'est là, en tous les cas, la façon dont en parlent plusieurs écrivains, parmi les plus notables: Tourgueniev, Maupassant, Conrad.⁶² Si l'hybride tient, comme il le paraît, de chacun de ses deux parents, il va donc s'agir de déterminer en quel sens la connaissance sensible doit, selon Démocrite, être considérée comme un produit de la mésalliance du Vrai avec le Faux; en quoi, autrement dit, cette demi-connaissance présente nécessairement des traits provenant de ses *deux* parents.

3. *Démocrite fut-il un sceptique?*

On comprendra sans doute que je n'aie pas jugé opportun de retenir, contrairement à ce qu'avance J. Barnes, l'image d'un Démocrite campant résolument dans l'aporie et la suspension du jugement ('le sceptique

⁶⁰ Cf. Decleva Caizzi (1984) 17.

⁶¹ Bailey (1928) 183. — On lit à la même page: 'Démocrite considérait, tout comme Épicure après lui, que les données sur lesquelles l'esprit fonde sa connaissance des atomes et du vide sont fournies aux sens par les phénomènes'.

⁶² Sur la bâtardise comme vivant témoignage d'une mésalliance accidentelle, nous pensons particulièrement à deux nouvelles de Maupassant, intitulées: 'Duchoux' (1887) et 'Un fils' (1882); à *Terres vierges* (1877) de Tourgueniev; et au roman de J. Conrad intitulé: *Sous les yeux d'Occident* (1911).

ticisme abdéritain est de type pyrrhonien', déclare expressément cet auteur⁶³). Démocrite a critiqué les données de la sensation afin d'éviter le réalisme naïf, mais n'en a pas moins pris appui sur celles-ci en tant que figures bâtarde du vrai. Et si, comme je souhaite l'avoir fait entendre, il a bel et bien cru atteindre la vérité des étants, en deçà du phénomène labile et fluent, s'il a été – pour parler le même langage que Sextus – un 'dogmatique' et non un sceptique véritable, il a dû tenir non seulement la raison, mais encore les *sens* eux-mêmes, quoique à un moindre degré, pour des critères de la vérité objective. — Les diverses anecdotes relatives à la cécité que Démocrite se serait infligée de lui-même ('ce grand philosophe', écrit Cicéron dans ses *Tusculanes*, estimait en effet 'que la vision des yeux fait obstacle à la pénétration d'esprit')⁶⁴ ont, notons-le, un incontestable intérêt: elles nous permettent de pressentir, elles aussi, que *Démocrite croyait qu'on pouvait atteindre le vrai*, – fût-ce par la force de la seule pensée.⁶⁵

Rappelons tout d'abord, pour mieux faire entendre cela, que l'on peut trouver d'innombrables mises en garde à l'égard de la connaissance sensible chez maints penseurs 'présocratiques' que rien n'autorise à tenir pour *sceptiques*: chez Xénophane, chez Héraclite et les Éléates; chez Empédocle également, ainsi que chez Anaxagore. La défiance de Démocrite à l'égard des sens n'a donc rien d'un *hapax*. 'C'est le propre d'âmes barbares (βαρβάρων ἐστὶ ψυχῶν), déclarait par exemple Héraclite, d'accorder foi à des sens dépourvus de raison'.⁶⁶ À ce qu'en dit Diogène Laërce, Parménide assurait aussi que 'la raison constitue le critère de la vérité et que les sens sont dépourvus d'exactitude'.⁶⁷

⁶³ Cf. Barnes (1989²) 563. — P.-M. Morel parle de façon beaucoup plus nuancée d'une 'dimension aporétique de la pensée de Démocrite', dans son étude intitulée: 'Démocrite, connaissance et apories' (1998) en partic.: 146 et 163.

⁶⁴ Cic. *Tusc.* V 29, 114 [68 A 22]: *atque hic vir impediri etiam animi aciem aspectu oculorum arbitrabatur*.

⁶⁵ Aulu-Gelle (Gell. *Noct. att.* X 17 [68 A 23]) prétend, de son côté, que Démocrite se priva lui-même de l'usage de la vue 'parce qu'il estimait que les pensées et les méditations de son esprit occupé à examiner les principes de la nature seraient plus vives et plus précises, une fois affranchies des prestiges de la vue et des entraves que les yeux constituent'.

⁶⁶ Sext. *Emp. Adv. math.* VII 126 [22 A 16] (trad. Dumont (1988) 141).

⁶⁷ Diog. Laert. IX 22 [28 A 1] (trad. Dumont (1988) 234): *κριτήριον δὲ τὸν λόγον εἶπε: τὰς τε αἰσθήσεις μὴ ἀκριβεῖς ὑπάρχειν*. — Voir également Sext. *Emp. Adv. math.* VII 111–114 [c'est-à-dire le fragment DK 28 B 1 du même Parménide] (trad. Dumont (1988) 255): 'le critère est constitué par la raison savante, c'est-à-dire par la raison invariable; aussi refusa-t-il d'accorder crédit aux sens'.

Sextus rapporte, en ce qui concerne Empédocle, qu'à ses yeux, 'le critère de la vérité n'est pas constitué par les sens, mais par la raison droite'.⁶⁸ Quant à Anaxagore, parce qu'il considérerait que chaque chose est formée de 'celles qui, étant en elle les plus nombreuses, sont de ce fait les plus visibles',⁶⁹ il a insisté, lui aussi, sur la 'faiblesse de nos sens' (ὕπ' ἀφανρότητος αὐτῶν),⁷⁰ et il a enseigné que les homéoméries 'ne sont visibles que pour la raison'.⁷¹ Aussi considéra-t-il, comme le fit Démocrite après lui, que 'les sensations sont trompeuses'.⁷²

Ce qui, sur ce point, paraît différencier Démocrite – ainsi qu'Empédocle et Anaxagore – de leurs prédécesseurs, et notamment des Éléates, c'est bien plutôt qu'ils *réhabilitent*, en quelque façon, le sensible, puisqu'ils sont tous trois d'accord sur ce fait que les sens, quoique leurs prestiges nous trompent bien souvent, constituent néanmoins des *chemins*⁷³ qui donnent en quelque façon accès au réel. Aussi peut-on parler, avec Stelio Zeppi, d'une 'réévaluation anti-éléatique de la sensation', chez les atomistes d'Abdère.⁷⁴ Dans un passage du traité *De la génération et de la corruption*, que Maria Michela Sassi juge à bon droit 'fondamental',⁷⁵ Aristote déclare que Leucippe 'croyait disposer d'explications s'accordant avec les données des sens (Λ. δ' ἔχειν ὡμήθη λόγους, οἵτινες πρὸς τὴν αἴσθησιν ὁμολογούμενα): selon lui, elles n'abolissaient (οὐκ ἀναίρει-σουςιν) ni la génération, ni la corruption, ni le mouvement, ni la multiplicité des choses. Ainsi réalisait-il l'accord de ses théories avec les phénomènes (ὁμολογήσας δὲ ταῦτα μὲν τοῖς φαινομένοις), sans pour autant renoncer à s'accorder avec les partisans de l'Un, auxquels il concède que le mouvement ne saurait exister sans le vide, que le vide est un non-être et que rien de ce qui est n'est un non-être'.⁷⁶ Et je ne vois pas

⁶⁸ Sext. Emp. *Adv. math.* VII 122–124 [31 B 2] (trad. Dumont (1988) 374): ἄλλοι δὲ ᾔσαν οἱ λέγοντες κατὰ τὸν Ἐμπεδοκλέα κριτήριον εἶναι τῆς ἀληθείας οὐ τὰς αἰσθήσεις, ἀλλὰ τὸν ὀρθὸν λόγον.

⁶⁹ Fragment reconstitué 'Simpl. *Phys.* 164.24 [59 B 12]'.
⁷⁰ Sext. Emp. *Adv. math.* VII 90 [59 B 21].

⁷¹ Aet. I 3, 5 [59 A 46]: ἃ ἦν λόγοι θεωρητὰ μόρια. — Il n'est, certes, pas exclu que cette dernière expression ait été, comme le voudrait J.-P. Dumont, puisée par Aétius dans le lexique épicurien; cf. Dumont (1988) 1429 n. 3 de la p. 640.

⁷² Cf. Aet. IV 9, 1 [59 A 96]: 'Anaxagore, Démocrite [...] disent que les sensations sont trompeuses' (ψευδεῖς).

⁷³ Cf. le fragment DK 31 B 133 d'Empédocle, Clem. Alex. *Strom.* V 81.

⁷⁴ Zeppi (1975) 124.

⁷⁵ Cf. Sassi (1978) 212.

⁷⁶ Aristot. *De gen. et corr.* I 8. 325a23–28 [67 A 7] (trad. Dumont (1988) 732–733).

que le fragment B 117, selon lequel la vérité est ‘au fond d’un puits’,⁷⁷ autrement dit profondément cachée, puisse renverser la présente interprétation.

Au reste, Diogène Laërce, tout comme Cicéron, montre à l’envi avec quelle générosité sans rivages les pyrrhoniens, puis les tenants de la Nouvelle Académie, se sont confectionné sans retenue des ancêtres ou des autorités empruntées: faisant d’Homère le ‘fondateur’ de leur secte,⁷⁸ ils avaient également trouvé dans les écrits des poètes (Archiloque, Euripide) ou dans telle maxime énoncée par l’un des sept sages, les indices d’une *tradition sceptique* dont ces illustres prédécesseurs avaient été, prétendaient-ils, les fourriers! De même, la plupart des grands physiiciens – Xénophane, Zénon d’Élée, *Démocrite*, Platon, Empédocle, Héraclite, Hippocrate – leur ont fourni un florilège de pensées détachées, propres à nourrir le penchant sans doute excessif de ces gens à l’établissement de généalogies d’occasion.⁷⁹

4. *Le rationalisme de Démocrite*

Qu’on se souvienne des quatre arguments que Démocrite avait proposés, selon le rapport d’Aristote, afin de prouver la réelle existence du vide. Le mouvement local, premièrement, n’existerait pas sans le vide: ‘pas de mouvement sans le vide’ (οὐ γὰρ ἂν δοκεῖν εἶναι κίνησιν, εἰ μὴ εἶη κενόν).⁸⁰ Telle est, écrit Aristote, la première façon dont les atomistes *démontrent* (213b15: δεικνύουσιν) que le vide existe (ὅτι ἔστι τι κενόν). ‘Deuxièmement’, d’après Leucippe et Démocrite, ‘l’expérience fournit quelques exemples de resserrement et de tassement’:⁸¹ ainsi, dit-on, les tonneaux reçoivent le vin avec les outres, comme si dans les intervalles vides qui sont en lui le corps condensé se resserrait’.⁸² En troisième lieu,

⁷⁷ Diog. Laert. IX 72 [68 B 117]: ἐτεῆμι δὲ οὐδὲν ἴδμεν· ἐν βυθῷ γὰρ ἡ ἀλήθεια.

⁷⁸ Cf. Diog. Laert. IX 71.

⁷⁹ Cf. Diog. Laert. IX 72. — [Galen.] *Hist. phil.* 4 [72 A 15]: ‘sont sceptiques (σχεπτικούς) Zénon d’Élée, Anaxarque d’Abdère et Pyrrhon, qui a porté à son point de perfection la philosophie du doute’; et surtout: Cic. *Acad.* II 5, 14 et *passim*.

⁸⁰ Aristot. *Phys.* IV 6 213b4–6 [67 A 19]. — *N.B.*: La traduction que Diels donne de ce passage fait subir quelques coupures à l’original. Nous nous référerons donc également à la traduction qu’H. Carteron a donnée de la *Physique* d’Aristote (Paris, Les Belles Lettres, 1926; rééd. 1966: I, 136–137).

⁸¹ C’est de cette façon que J.-P. Dumont rend, en glosant un peu, un membre de phrase ainsi rédigé en grec: ἄλλον δ’ ὅτι φαίνεται ἔνια συνιόντα καὶ πιλούμενα.

⁸² Cf. Aristot. *Phys.* IV 6. 213b16–18 [67 A 19] (trad. Dumont (1988) 739).

les partisans du vide tirent argument de ce fait ‘que l’augmentation (αὔξησις) paraît à tout le monde (δοκεῖ πᾶσι) être produite par le vide: la nourriture en effet est un corps et deux corps ne peuvent coexister’.⁸³ Autrement dit, lorsqu’un animal absorbe aliments ou boissons, il faut bien qu’en son organisme, des canaux, des pores, des conduits ou autres ‘petits pertuits’, pour parler avec Jacques Amyot,⁸⁴ laissent le passage aux nourritures ingurgitées. Car il est impossible que le plein reçoive rien.⁸⁵ Les anciens atomistes invoquent enfin, et c’est là leur quatrième argument, ‘le témoignage (μαρτύριον) de ce qui arrive quand la cendre reçoit une quantité d’eau égale à celle du vase vide’:⁸⁶ comment expliquer en effet que, dans un vase rempli de cendre, on puisse faire tenir encore autant d’eau que s’il n’y avait point de cendre et, pour ainsi dire, doubler la quantité de matière que contient initialement celui-ci? Notons d’emblée que tout cela est parfaitement analogue à ce que seront les schémas des raisonnements lucrétiens en forme de *modus tollens*, lesquels prendront systématiquement appui sur une constatation expérimentale (*v.g.* l’existence du mouvement), sur une constatation qui nous est connue et sans cesse confirmée par les *sens*. Lucrèce reprendra d’ailleurs sans rien y changer le premier et le troisième des quatre arguments qu’on vient de rappeler.⁸⁷

Est-ce à dire que Démocrite a pu croire, comme ses successeurs épicuriens, que la sensation est le premier critère de la vérité? — Assurément, non! Mais je crois qu’il y a lieu, cependant, de souscrire à l’heureuse expression de Lambros Couloubaritsis qui a parlé, à propos du démocritéisme, d’ ‘une double approche du réel’.⁸⁸ Le cas de la double justification concernant la thèse en vertu de laquelle le nombre des formes d’atomes est nécessairement infini, paraît, à cet égard, tout à fait édifiant. Car cette vérité est induite, d’une part, de manière *expérimentale*, à partir de la variété infinie des phénomènes empiriques (‘étant donné qu’ils estimaient que le vrai est dans les phénomènes et

⁸³ Aristot. *Phys.* IV 6. 213b18–20 [67 A 19].

⁸⁴ Critiquant la théorie épicurienne de la perception, Plutarque daube, en effet, ‘ces proportions et convenances de pores ou petits pertuits (πόροι) des sentiments dont [les disciples d’Épicure] babillent tant’; cf. Plutarch. *Adv. Col.* (trad. J. Amyot), in *Œuvres morales*, éd. Michel de Vascon, 3^e éd.: 1575, 589 B (*Adv. Col.* p. 1109 C).

⁸⁵ Cf. Aristot. *Phys.* IV 6. 213b6–7.

⁸⁶ Aristot. *Phys.* IV 6. 213b21–22. — La même question sera débattue dans les *Problèmes*: *Probl.* XXV 8. 938b24–939a9 (éd. et trad. P. Louis, Paris: II, 188 sq.).

⁸⁷ Lucret. *De rer. nat.* I 335–345 et 346–357.

⁸⁸ Couloubaritsis (1980) 129–145.

que les phénomènes sont contraires et illimités, [les atomistes] tenaient les figures pour illimitées⁸⁹. Mais, chez Leucippe (et, très probablement, chez Démocrite également), le même dogme pouvait être fondé, d'autre part, sur un raisonnement, pour le coup, strictement logique: ainsi, affirme Simplicius, Leucippe avait-il formé 'l'hypothèse que les atomes sont des éléments illimités et toujours en mouvement, et qu'ils renferment un nombre illimité de figures, du fait que rien n'est plus ceci que cela' (διὰ τὸ μηδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον εἶναι).⁹⁰ — Autre indice de cette *double approche* du réel: au vu des témoignages d'Aristote et de Théophraste, une qualité phénoménale—comme, par exemple, la couleur—peut à la fois être dite objective (cf. 68 A 126, et surtout: 68 A 135, §73–82) et non-objective (68 A 123). Car le sensible n'est réductible ni à une affection arbitraire de celui qui sent, ni à l'adéquation pure et simple du sujet et de l'objet. Et, précisément, parce qu'il tient des deux à la fois, son statut, comme l'écrit Zeppi, est, celui d'un 'intermédiaire' (*intermedio*) entre le faux et le vrai, – et, partant, celui d'un truchement, d'une *perspective* susceptible de nous donner accès, en deçà du changeant et du bigarré, à ce texte original dont le sage connaît, de science sûre, qu'il est fait de caractères atomiques et corpusculaires en un certain ordre assemblés. On ne répugnera donc nullement à parler, avec Zeppi et Luria, de la présence d'une sorte de 'logique inductive' dans cette théorie de la connaissance,⁹¹ – du moment que la connaissance des réalités ultimes par l'esprit dérive bel et bien selon Démocrite d'une inférence fondée, en dernier ressort, sur les données délivrées par les sens.⁹²

⁸⁹ Aristot. *De gen. et corr.* I 1. 315b9–11 [67 A 9] (trad. Dumont (1988) 735): ἐπεὶ δ' οἷοντο τὰληθὲς ἐν τῷ φαίνεσθαι, ἐναντία δὲ καὶ ἄπειρα τὰ φαινόμενα, τὰ σχήματα ἄπειρα ἐποίησαν. — Cf. également, Aristot. *De cael.* III 4. 303a11–13 [67 A 15] (trad. Dumont (1988) 738): 'puisque les corps diffèrent par les figures, et que les figures sont illimitées, les corps simples, disent-ils, sont, eux aussi, illimités'.

⁹⁰ Simpl. *Phys.* 28.4 [67 A 8] (trad. Dumont (1988) 734).

⁹¹ Zeppi (1975) 129; ainsi que: Luria (1970) II, 433, *ad* n° 72.

⁹² À cet égard, il faut souligner l'importance capitale du frag. DK 68 B 125 [Gal. *De exp. med.*, fgm., éd. H. Schöne, 1259, 8], dans lequel les sens rappellent à la raison que c'est d'eux qu'elle tire les éléments de ses propres croyances, et qu'elle se terrasserait elle-même si jamais elle s'aventurait à tenter de les réfuter.

5. *Les mathématiques démocratéennes*

Je voudrais enfin tâcher de faire ressortir que le peu qu'on sait des mathématiques démocratéennes est compatible au plus haut point avec ce qui vient d'être dit. Il semble, notamment, d'après un passage de Plutarque, que Démocrite considérait que la génératrice du cône n'est pas une ligne droite mais une ligne brisée: les sections de ce cône seraient, en effet, inégales si l'on venait à le couper en suivant un plan parallèle à sa base, faute de quoi ce serait, selon Démocrite, un... cylindre!⁹³ Car, malgré l'égalité apparente des pentes que le cône présente à nos yeux, la connaissance légitime nous permet d'assurer que celles-ci sont en réalité constituées de paliers microscopiques, de grandeurs indivisibles. Les *marches* de cette pyramide à degrés, ou encore, de cette 'ziggourat', comme l'appelle plaisamment J. Barnes,⁹⁴ ne doivent pas être considérées comme des segments infiniment petits: car, n'étant pas inévidentes, elles ont nécessairement *au moins l'épaisseur d'un atome*. — Il apparaît, aussi, que le philosophe d'Abdère a conçu la sphère comme 'une sorte d'angle', ὡς γωνία τις οὖσα,⁹⁵ c'est-à-dire comme un polyèdre.⁹⁶ On saisit ici au passage l'effet globalement désastreux qu'a pu avoir en géométrie la répulsion des atomistes à l'égard de tout ce qui ressemble à de l'infiniment petit actuel. — Mais ce qui importe le plus, c'est que l'on constate ici derechef que les sens, *alors même qu'ils suscitent l'illusion d'une continuité qui n'est pas dans la vérité des choses*, nous mettent néanmoins sur la voie de la connaissance véridique. Car, de même que ce sont les sens qui nous font d'abord appréhender une pyramide aux arêtes rectilignes là où l'intellect saura ultérieurement débusquer un empilement de surfaces inégales,⁹⁷ de même, ce sont eux qui nous font saisir que plus un dessin sera précis, plus sera petite la zone de contact de la tangente avec le cercle. Et c'est la connaissance légitime qui révélera, finalement, que le point de contact est, en réalité, encore plus petit que la plus petite longueur perceptible. Protagoras, dont la plupart des

⁹³ Plutarch. *De commun. not.* 39 p. 1079 E [68 B 155].

⁹⁴ Barnes (1989²) 357. — Les *ziggourats* sont, comme on sait, de gigantesques tours à étages, situées généralement en retrait des temples chaldéens ou babyloniens; les astrologues s'en servaient comme d'observatoires.

⁹⁵ Aristot. *De cael.* III 8. 307a16–17.

⁹⁶ De même, au dire de Simplicius, le sophiste Antiphon pensait, en rapport avec le problème de la quadrature du cercle, qu'il 'finirait par inscrire dans le cercle un polygone, dont les côtés, grâce à leur petitesse, s'appliqueraient à la circonférence du cercle'; cf. *Simpl. Phys.* 54.12 [87 B 13].

⁹⁷ Voyez à ce propos: Morel (2001) 73–87.

commentateurs estiment que Démocrite a polémique avec lui dans son traité *De la différence du jugement, ou du cercle et de la sphère*, est donc, du même coup, réfuté, – lui qui prétendait que l'intellect est incapable d'atteindre aucune vérité qui demeurerait cachée pour les sens.⁹⁸

⁹⁸ Cf. Protagoras, *ap. Hermias Irris. gentil. philos.* 9 [80 A 16] (trad. Dumont (1988) 991): 'les objets qui tombent sous les sens existent, ceux qui ne tombent pas sous les sens n'existent pas' (τὰ μὲν ὑποπίπτοντα ταῖς αἰσθήσεσιν ἔστι πράγματα, τὰ δὲ μὴ ὑποπίπτοντα οὐκ ἔστιν ἐν τοῖς εἶδεσι τῆς οὐσίας).

DEMOCRITUS, ZOOLOGY AND THE PHYSICIANS

LORENZO PERILLI

1. *Preliminary remarks*

In 1645, the distinguished anatomist and surgeon Marcus Aurelius Severinus (1580–1656), an adopted Neapolitan on active service at the Hospital for Incurables, wrote a treatise on general anatomy that was to have its role in the history of medicine. Severinus was well known in Italy and abroad for his operating technique, and at various times he was arrested and convicted by the Inquisition. His treatise, published in Nürnberg, has the unusual title of *Zootomia Democritea—idest Anatome Generalis Totius Animantium Opifici*. It opens with the transcription of one of the best known among the alleged letters of Democritus to Hippocrates concerning the research of modalities and causes for diseases, and it addresses also the usefulness of dissection, a method of exploration to which Severinus himself used to resort—for this very reason being brought to trial by the Inquisition.

As to the autoptic study of animals, the myth of the *primus omnium Democritus*, which found such a surprising hospitality in Severinus' work, largely predominated from antiquity and continued through the centuries (a history of which would surely be of interest in its details) and accounts for the key position of Democritus in every reconstruction of pre-Aristotelian zoology. This portrayal found easy access into later paradoxography, beginning with the imagined meeting of Hippocrates and Democritus at Abdera; its literary form was that of the pseudoepigraphic epistles included among the Hippocratic writings (*Epist.* 10–21 and 23, especially 17; see also Soranus, *Vita Hippocr.*, 6). The story is far from unimportant: it attests the creation of a symbolic figure while at the same time influencing it, a figure to whom the most improbable writings came to be attributed.¹ The same story of the fancied visit

¹ It is highlighted by Wolfgang Speyer, in his well known book on the 'literarische Fälschung' (1971), where he recalls Democritus' not incidental fame as a 'Zauberer' (p. 40).

of Hippocrates to his contemporary Democritus was used by Theodor Gomperz to open the chapter on atomism in his *Griechische Denker*, mirroring, he says, 'bis zu einem gewissen Punkt einen realen Sachverhalt' (I 261). According to this anecdote, Hippocrates had been called to heal Democritus' insanity—Democritus who used to laugh at anything, even at other people's misfortune. In the shade of the plane-trees, near the city walls, the philosopher was sitting *inter occisa corpora multarum animantium* (Severinus, p. 9), surrounded by the remains of animals he had dissected for scientific purpose. So, intent on his activity, Hippocrates would have found him.

Democritus' real contribution to 'zoology' has still to be established. Zeller made short shrift of Democritus' observations on animals, devoting to them just two lines of text and a schematic page of footnotes; he considered them (at least in the form in which they have survived) nothing more than isolated observations and hypotheses. Elsewhere, however, a marked reappraisal of Democritus' studies concerning organic nature has led scholars to assign him a leading role as the sole forerunner of Aristotle.

As to the study of animals, Aristotle's filter actually can distort the perspective, since it is with his research that zoology achieves the status of an autonomous science whose parameters cannot be superimposed on the preceeding phase. Aristotle's claim is correct, when in the first book of *De partibus animalium* he declares himself the founder of zoology (645a6): only with him can the discipline be envisaged as an autonomous one. As to the previous period, the warning (expressed among others by Pierre Pellegrin, 1986, 170) can be shared that any attempt to reconstruct a 'zoology' will run methodological as well as intrinsic risks. The term 'zoology' itself is inadequate when applied to the period before Aristotle—in what follows I will make use of it for the sake of brevity, but this does not imply the actual existence of such a discipline. Nevertheless, in this rather distinct phase, a significant amount of specific and even specialist knowledge had been set up concerning the animal world; due to the epistemological importance an individual meaning must be attached to each attempt at systematization and classification according to criteria corresponding to diverse and precise needs. The classification of animal species—or typologies, should the term 'species' appear untimely—was indeed a decisive element.

Long before Aristotle, the animal world had been the object of widespread interest. We have detailed studies concerning Homer, early lyric

poetry, Herodotus and many other sources, and we owe a number of observations to presocratic naturalists. A similar interest is witnessed in subsequent phases from the pre-Homeric (Minoic) age up to that of Speusippus, Mnesitheus and Diocles of Carystus. One can see the forming of knowledge strata which Aristotle himself will amply draw on. To this framework belongs Democritus, who receives from Aristotle his privileged position as an interlocutor, with several (not always positive) references.

The role of Democritus seems, nevertheless, to be anything but unambiguous, and I will try to give a more substantial character and, above all, historicity to his investigations, aiming at a reconstruction of the framework and of the network of connections in which his explorations are inscribed, although limited to a few fundamental elements. Despite the privilege he received from Aristotle, Democritus was not isolated, and to clarify his position requires at least verifying the content of the surviving materials, usually considered only summarily, as well as testing the reliability of sources dealing with his zoological studies—considering both the content and the authenticity of the works attributed to him by Thrasyllus' Catalogue as is found in Diogenes Laertius, whose titles have a strong aetiological slant (*Αἰτίαι περὶ...*).

2. *Democritus, traditional knowledge, and medical learning*

When evaluating the relationship of Democritus to this framework, the main role is played on the one hand by the treatises of the Hippocratic corpus and on the other hand by what we may call traditional knowledge. Indeed, considering the whole pre-Aristotelian period, and assuming Diocles of Carystus as a provisional arrival point, medicine can be identified as the main axis of zoologically-oriented research. Scholars have more than once assumed that Democritus' studies of animals directly influenced those writings of the Hippocratic corpus that show a zoological interest, primarily the second book of *De victu*—but this is to reverse the perspective. Actually, concerning zoological investigations, Democritus does not seem to make significant innovations. He seems rather to take up a position on topics which had been largely discussed and to act as a point of confluence of the two main, still-traceable routes: the 'functional zoology' of physicians, and the comparative attention to animals in order to draw analogical conclusions for man and the world.

We know, thanks to a series of investigations, that the Greeks from the most distant past (as seen as early as 1869 by E. Bruck) took advantage of knowledge which was to become increasingly detailed. This knowledge mirrors the more specific expertise of the *technitai*, on whose experience the information displayed by Aristotle will rest as well. Many examples could be adduced to show the interest in a knowledge which preexisted and continued to persist, compared to the development of zoology as a science, which was consolidated and structured during the fifth century.² Hence, one can set some points of departure, starting with the survey of names of animals in the authors at issue, a topic which can be of interest in itself—whether or not they have a motivated structure as is the case in Hecataeus and the comic poets, mainly towards the end of the fifth century (e.g., already Epicharmus, then Archippus, Philyllus, Aristophanes himself). Within philosophy, the main phases are well known, although essential links are probably lacking. The tradition attributes to Alcmaeon a not incidental resort to experiments and at least random dissections of animals, in order to explain anatomical and physiological issues. In Empedocles, according to Zeller and to later scholars, we see an attempt at taxonomic distinctions (B 20, 33, 76, see also 9, 117), which, however, will hardly have gone beyond common and already traditional knowledge, though Aristotle's references in his zoological works imply due consideration for Empedocles. Anaxagoras and Diogenes of Apollonia, too, can be counted among those who had an interest in zoology, and they too are explicitly mentioned by Aristotle—as was Democritus. A later philosophical outcome will be Anthistenes' *De natura animalium* and Speusip-

² The studies on this topic in its pre-Aristotelian phase start as far back as 1839 with W.Ph.Fr. Groshans and his (incomplete) *Prodromus faunae Homeri et Hesiodi*, and go on until Otto Körner's *Die homerische Tierwelt*, 1930 (and as early as 1917 in his *Das homerische Tiersystem und seine Bedeutung für die zoologische Systematik des Aristoteles*, with its hypothesis of an Homeric 'Tiersystem' then rightly rejected by scholars), passing through a series of works whose details can be found in the Bibliography. I would mention here, because they are devoted to specific fields of growing interest in the first decades of the 20th century, only the work of Norman Douglas, *Birds and Beasts of the Greek Anthology* (1928), and Hans Gossen's several interventions, published in various periodicals and in the *Realencyclopädie*, as well as the two glossaries by D'Arcy W. Thompson on birds and fishes respectively (1895, then 1936, the former, and 1947, the latter) and the *Antike Tierwelt* by Otto Keller (Leipzig 1909–1913). I include as well the first part of the noteworthy study of Adolf Palm (1933), entitled *Untersuchungen über die Geschichte der Zoologie bis auf Aristoteles: Die Entstehung des älteren Tiersystems und seine Nachwirkung bis zum Ende des 4. Jahrhunderts v. Chr.*, and, finally, the short but acute article by Georg Harig and Jutta Kollesch (1974). These are but a few of the most relevant examples. Most recently, see Zucker (2005).

pus' Ὅμοια. Speusippus offers series and classifications of animals (see fr. 125ff. Isnardi) which no doubt recall those of his predecessors, while only partially corresponding to those of Aristotle. Starting from this observation (which has already been made by Long, then by Isnardi), I wonder if Speusippus' information could not go back rather to the so called alternative cataloguing of the medical tradition, which also occurs in culinary literature, as attested in the comic fragments of the end of the fifth century and the first half of the fourth, from Philyllius to Ephippus, Mnesimachus, Theopompus—and maybe already Cratinus, all of whom we know mostly through Athenaeus.

Before considering in some detail the position of Democritus, it is necessary to give a closer look at the other fundamental direction of studies of zoological interest in the fifth and fourth centuries, viz. that of medical tradition. A rather well known essay, published by the zoologist Rudolf Burckhardt in 1904, tried to reconstruct the development which would have lead to Aristotle's systematization. Burckhardt located in the Hippocratic writings, particularly in chapters 46–49 of the second book of *De victu*, a systematic cataloguing of edible animals, in that 52 types of animals (about one-tenth of those recorded by Aristotle) were distinguished and classified, together with a description of their dietary characteristics and sometimes an attempt to adduce also the cause of such characteristics. Burckhardt saw in this classificatory scheme a proper 'koisches Tiersystem'. It was afterwards generally agreed to be a 'system', although its origin in the Coan milieu is not certain, and the alternatives suggested later, of an 'hippokratisches', or better 'voraristotelisches Tiersystem' (definitions proposed, respectively, by G. Harig-J. Kollesch and A. Palm), are to be preferred.

It will be of some use to remind the reader that the *De victu* can be dated to the last years of the fifth century, or perhaps to the first years of the fourth, i.e. nearly the same period as Democritus. The work consists of four books (three according to Galen, who combined the third and the fourth). The first presents an analysis of the nature of man, composed basically of fire and water (to which correspond the pairs hot-dry and cold-wet), and of the formation of embryos, while the third defines the appropriate regimen by means of the connection between nutrition and physical exercise, and investigates its disruptions and their potential pathological consequences. The fourth book deals with the role of dreams and has the alternative title περὶ ἐνυπνίων. In

this framework, the second book plays a special role. After two introductory chapters (37f.) on the effects of places and winds, it offers a series of ‘catalogues’ which remain unrivalled within the corpus as to extent and structure. These catalogues deal with the various elements of regimen—food, drink, and exercises—and with their respective characteristics and properties. It is clearly a technical insertion into the treatise, which has a more general, even philosophical character at times, the first book above all having been often associated with Heraclitean thought. Who the author is, and whether there was only one author, we do not know, and so it has been from antiquity, as Galen reports (see VI 473, XV 455); but little doubt remains that the second book has the character of a handbook and that its contents refer to earlier studies and classifications. It should not be ignored that Galen considered the second book of *De victu* as being worthy of Hippocrates—the only one which could reasonably be attributed to him (see *De alimentorum facultatibus* VI 473 K τὸ μὲν οὖν δεύτερον, ἐν ᾧ περὶ τῶν σιτίων διέρχεται, τάχ’ ἂν τις εὐλόγως Ἱπποκράτους ἄξιον ἡγήσαιτο).

The writer of the treatise (I refer only to the second book), while listing the 52 types of animals dealt with in chapters 46 and following, orders them first according to the more general classes (mammals, birds, fishes and other aquatic animals such as crustaceans and molluscs—the latter with the further development of the conchiferous), and then at times according to their habitat or nourishment, but primarily, and systematically, according to the δύναμις that they exert on those who feed on them, that is to say their dietary property—light or heavy, dry or moist, fat, astringent or laxative, slimming, useful for eyesight, or diuretic. This is a basic criterion for understanding that these investigations have no autonomous heuristic value, but rather receive their motivation from elsewhere. This is a fundamental point in tracing the development of these studies. Already Aristotle saw the line that divided the lore of the *technitai* (in his case fishermen, his main source of ‘oral’ information) from the knowledge of the scientist in the merely practical aim that prevents the former from adopting the larger, epistemological point of view. The scientist, on the other hand, investigates not in view of an incidental aim, but rather τοῦ γινῶναι χάριν (*GA* 756a33).³

³ See Vegetti (1980) 23, and also (1980b).

The author of *De victu* II is fully aware of the effort he is about to make. He describes with a dietary purpose not only animals, but also other things, primarily substances of vegetable origin, and he puts first a short methodological chapter (the 39th, which introduces the cataloguing of the various substances), in which he criticizes those forerunners who had tried to organize genres and categories from a more general point of view. Each substance, he argues instead, has a different δύναις, and he finds that this very criterion of the specific δύναις is the one to be adopted. To understand the dispute one must place it in the context of a medical debate that was long on-going, as also the *De aëribus aquis locis* asserts (as we shall see later on).

Be that as it may, the generally positive judgement concerning Burckhardt's work can still be shared, with the exception perhaps of his attempt to establish a too-direct connection with Aristotelian schemes. It is self-evident not only that the text of the Hippocratic treatise has the characteristics of the systematic classification Burckhardt saw in it (as did others after him), but also that it no doubt goes back to one or more earlier sources whose results it schematizes and perhaps rearranges.

Unlike the scanty information on the zoological interest of some pre-socratic philosophers and the merely hypothetical conclusions we can draw therefrom, the Hippocratic corpus presents us with a significant turning point that is not isolated. Though this is not the place to go into further detail, it must at least be pointed out that elements similar to those already mentioned can be found within the corpus itself, viz. in *De affectionibus* (περὶ παθῶν), and above all in *De affectionibus interioribus* (περὶ τῶν ἐνθὸς παθῶν), both earlier than *De victu*, where one finds a series of 19 fishes, all of them occurring in fixed groups (with only one exception in *Aff. int.* 49, where a fourth fish is added to the usual group of three). These treatises do not have the detailed structure of *De victu*, but still show significant similarities which become evident in the animals' being grouped according to common characteristics and in these groups being regularly repeated. Such coincidences cannot be taken to be random, and are scarcely the result of autonomous investigations by each author; rather, they refer to one or more systematizations that were established at that very time.

3. *The post-Hippocratic medical tradition*

It is no coincidence either that the Hippocratic systematization occurs again in the medical tradition that immediately followed, between Mnesitheus of Athens, who was especially interested in dietetics and in the first half of the fourth century wrote a treatise *De edibilibus*, in which a classification concerning food like the one of *De victu* could easily find a place, and Diocles of Carystus,⁴ who has been sometimes considered to be the link between the Hippocratic organization of the animal world and Aristotle.⁵ Already in the mid-fifth century the works of a certain Leophanes, mentioned for his view of generation and sex differentiation by Aristotle in the fourth book of *De generatione animalium* (765a21–25), and later in Pseudo-Plutarch's *Placita* (*Dox. Gr.* 420,7), demonstrate the ramifications of zoological, or perhaps more generally, biological knowledge.⁶ As G. Harig and J. Kollesch observed, the similarities between various authors, particularly the Hippocratic author of *De victu*, Mnesitheus, and Diocles, are not due to accident. Their comparison of the characteristics of edible animals (with a preference for marine fauna) shows common basic notions. In *De victu* the qualities listed are dry (ξηρός), moist (ύγρός), light (κοῦφος, ἐλαφρός), heavy (βαρύς), rare (ἀραιός), dense (στερεός, βαθύς), and fat (πίων). The same or very similar terms occur in Diocles and Mnesitheus, and sometimes

⁴ Diocles is now generally considered to be a contemporary of Aristotle, as the ancients believed, perhaps even a bit earlier; a different proposal (340–260) had been made by Werner Jaeger. See Kudlien (1963) 456–461, von Staden (1989) 44ff., and (1992) 251–264, more recently Ph. van der Eijk, in his edition of the fragments of Diocles (II 31ff., etc.).

⁵ See Palm, 14f., 18.

⁶ Leophanes is an unknown author, one banished from all reference works I could consult, starting with the *Realencyclopädie*. Aristotle devotes four lines to his theory of the generation of males and females each from a different testicle, and the same is said, much more concisely, by Pseudo-Plutarch—a doctrine attested in the Hippocratic writings, for instance in *De superfetatione*, ch. 31, see *Epid.* IV 4,21, and one which witnesses the right-left polarity, so important for Greek thought, see Lloyd (1966) 50 and passim, and (1973), 167–186. It should be noticed that, although these doxographical lists do not allow any conclusion, in the *Placita* Leophanes occurs in a chapter entitled Πῶς ἄρρενα γεννᾶται καὶ θήλεα, and his name follows those of Empedocles, Parmenides, Hipponax (?), Anaxagoras, and before Leucippus and Democritus (the doctrine of ἐπιζῳαίτεια), and again Hipponax. Leophanes' name is also found in two commentaries to the *Parva naturalia*, respectively Themistius (V 6.12) and Michael (32,3), but only as an example of solecism for the possible confusion Λεωφάνης / Λεωσθένης. Theophrastus, *causs. plant.* II 4,12, mentions him among τὴν μελάγγεων (the dark earth) ἐπαινοῦντες. Photius (*Bibl.* 114b8) lists him among the authors of philosophical books.

other items are added. Diocles and Mnesitheus know the same pre-Aristotelian 'Tiersystem' as the one attested to in the writings attributed to Hippocrates. The fragments from Diocles' Ὑγιεινὰ πρὸς Πλείσταρχον and Περὶ θεραπειῶν show the same taxonomic criterion: the δύναμις of the animals used as food and possibly for therapeutic purposes.

Here we have an essential point which allows us to argue that the classification of living beings, that is, the definition of categories and groups to which animals with common characteristics belong, was very likely not due to philosophical reflection, but to medical research. The latter had, indeed, neither a generic nor a scientific interest (improbable for that time), but it did have well-defined goals and needs which provided an adequate motivation for research and the application of ordering criteria. As previously suggested, there were two main lines along which the study of the animal world had been organized: dietetics, familiar as one of the main components in ancient therapeutics, and zootomy as an instrument for comparative study in order to draw conclusions about the human anatomy, knowledge about which, if not absent, was certainly very limited and rare, being systematically explored only in Hellenistic medicine. All these authors are indebted to a common source, not necessarily a single written source, but rather a 'geistige Atmosphäre',⁷ which also nourished the natural philosophers of the time—a widespread debate which penetrated different disciplines.

4. *Handbooks and the evidence of historians and comic poets*

Medical treatises as practical handbooks originated from the concurrence of the different *technai*. As such, these works acted as the point of confluence for a knowledge which had developed over the course of time and was in the hands of those same *technitai* who would be Aristotle's main authorities, fishermen as well as butchers, farmers, hunters, veterinarians, apiarists, and cooks. They possessed an often remote empirical lore, usually beyond the grasp of the layman. It is from them that Aristotle systematically draws information.⁸ Such a direct source

⁷ See Harig and Kollesch (1974) 30.

⁸ See the very good outline of Preus (1975) 23ff., particularly 36ff.; Manquat (1932) 49–73; Vegetti (1971) 20f. On Aristotle see also Kullmann (1979), Kullmann–Föllinger (1997), on zoological enquiries Kullmann (1998).

surely was also known to his forerunners, including the physicians, and the competition between cooks and doctors in Greece, so amusingly portrayed by comic poets, is especially relevant if we consider that the zoological interest of physicians was focused on edible animals. One feature concerning the knowledge of animals, remarkably shared by Hippocratic doctors and Aristotle, is that aquatic animals outnumber terrestrials in their studies; this is easily explained, Greeks being so predominantly fishermen and sailors.

We must not underestimate, in this respect, the cookery handbooks (ὄψαρτυτική or μαγειρική τέχνη), which had a continuous development from the second half of the fifth century to the Imperial Age, a literary genre which became more and more specialized (there existed treatises exclusively devoted to fish dishes, or to baked goods, ἀρτοποιικά, as was the case of Iatrocles, according to Athenaeus). Cookery and dietary books written by physicians followed a parallel but autonomous route.⁹ Nor should the impact of these classifications of animals outside the scientific framework be ignored, as for instance in late fifth-century comedy, of which Philyllius fr. 13 K.-A. is a good example, with three consecutive verses devoted to a list of 17 aquatic animals. These are not listed at random, however, but carefully follow the classifications attested in the medical sources.¹⁰

⁹ Works of reference on 'Kochbücher' and 'Kochkunst' include those of Bilabel (1921) and Orth (1921). See also Klüger (1911), Bilabel (1927). More recently Dohm (1964), Berthiaume (1982), Degani (1990) and (1991), Wilkins, Harvey, Dobson (1995).

¹⁰ Philyllius, fr. 13 (ap. Athen., *Deipn.* III 86e): πουλυπόδειον, σηπιδάριον, κάραβον, ἀστακόν, ὄστρεον, / χήμας, λεπάδας, σωλήνας, μῦς, πίννας, κτένας ἐκ Μυτιλήνης / αἶρετ' ἀνθρακίδας, τρίγλη, σαργός, κεστρεύς, πέρκη, κορακίνος. From fragment 10 (ὁ μάγειρος ἀδικήσας κτλ.) of the same comedy, entitled Πόλεις, we learn that the main character was, of course, a cook. Palm (1933, 19) thought it very plausible that the author had a book containing zoological materials before him; in any case, he closely follows the pre-Aristotelian 'Tiersystem', as can be seen from a comparison with the Hippocratic *De victu*, Diocles, Speusippus, Aristotle (see Palm, l.c.). Such lists are frequent in the comic poets, where often the same animals as in the *De victu* occur, see e.g. Mnesimachus fr. 4.31 (ap. Athen., *Deipn.* IX 403b-c): θύννον τεμάχη, / γλάνιδος, γαλεοῦ, ῥίνης, γόγγρον, / φοξίνος ὄλος, κορακίνος ὄλος, / μεμβράς, σκόμβρος, / θυννίς, κωβίός, ἡλακατῆνες, / κυνός οὐραῖον τῶν καρχαριῶν, / νάρκη, βάτραχος, πέρκη, σαῦρος, / τριχίας, φνκίς, βορίκος, τρίγλη, / κόκκυξ, τρυγών, σμύρανα, φάγρος, / μύλλος, λεβίας, σπάρος, αἰολίας, / θριττα, χελιδών, καρίς, τευθίς, / ψῆττα, δρακανίς, / πουλυπόδειον, σηπία, ὀρφώς, / κάραβος, ἔσχαρος, ἀφύαι, βελόναι, / κεστρεύς, σκορπίος, ἔγγελος, ἀρκτος, / κρέα τ' ἄλλα (τὸ πληθὺς ἀμύθητον) / χηνός, χοίρου, βοός, ἀρνός, οἴος, / κάρπου, αἰγός, ἀλεκτρονός, νήττης, / κίττης, πέρδικος, ἀλωπεκίου. Similarly Ephippus fr. 12, 1ff. (ap. Athen., *Deipn.* VII 322d-e), clearly and directly related to Mnesitheus (as the italicized series shows): θύννον τεμάχη, γλάνιδος, γαλεοῦ, / ῥίνης, γόγγρον, κεφάλον, πέρκης, / σαῦρος, φνκίς, βορίκος, τρίγλη, / κόκκυξ, φάγρος, μύλλος, λεβίας, / σπάρος, αἰολίας, θριττα, χελιδών, /

A vehicle of this kind of knowledge in its wider (not merely technical) impact can easily be seen in the descriptions made, for example, by Herodotus, as well as by Hecataeus¹¹ one century earlier, of exotic (particularly Egyptian) animals, whose features and habits these authors specified. Hecataeus' prolonged stay in Egypt is attested with certainty, as are his writings concerning those regions with descriptions of flora and fauna, which were commonly used from Herodotus onwards. A 'descriptive zoology', which was to find an important follower, between the end of the fifth and the beginning of the fourth century, in Ctesias, known as an historian but also from an ancient Cnidian family of physicians. Ctesias is mentioned more than once by Aristotle (and later by Aelian, whose testimony is essential to us), who clearly bears the traces of such sources, which can be identified by means of a direct comparison—as the zoologist Maurice Manquat has done for Herodotus, showing an often direct and hardly questionable dependence.¹² It is not possible to track here the development of these research efforts in their entirety, but the ones described so far are the most evident and eloquent coordinates in which Democritus and the other naturalists are to be set.

Classifications such as the one of *De victu* or the others hitherto considered, perhaps in a more simple but quite similar form can probably be traced further back, since the author of the Hippocratic *De morbo sacro* (which is plausibly dated around 430, see below) had already criticized their abuse or misuse by people characterized as 'magicians, purifiers, charlatans, quacks' (I 4 Jouanna = II Jones). And the *De victu* itself, as already noted, while proposing its own classification, opposes 'those who have undertaken to treat in general either of sweet, or fat, or salt

καρίς, τευθίς, ψήττα, δρακαινίς, / πονλυπόδειον, σπηρία, ὀρφώς, / κωβιώς, ἀφύαι, βελόναι, κεστρεῖς. I wonder whether the two texts are interdependent or rather draw on the same source, as the differences seem to indicate, a source such as a repertoire of the sort which must have been popular already during the fifth century—an hypothesis, which is close to the one proposed by Palm for Philyllius.

¹¹ The logographer from Miletus, not the later H. from Abdera, the latter perhaps a follower of Democritean philosophy at the beginning of the Hellenistic age, who wrote *inter alia* an important work called Αἰγυπτιακά.

¹² See Manquat (1932) 37–47. He prints in parallel columns the (translated) texts of Herodotus and of Aristotle's *Historia animalium* (where the historian is never mentioned); a further source had been supposed in Hecataeus, see W. Jaeger (1923) 326 n., Palm (1933) 6. It is relevant that among the large number of animals mentioned by Aristotle, those from non-Greek regions (particularly Egypt) almost systematically agree with those already described by Herodotus and other earlier sources (see Manquat, 100).

things, or about the power of any other such things' (II 39), positing instead different and more effective criteria: 'since therefore it is impossible to set forth these things in general, I will show what power each one has in particular' (ibid.).

Although sporadic or fragmentary, the evidence in favour of a systematization of pre-Aristotelian zoological knowledge is neither too scarce nor lacking in intrinsic coherence. The same classes and classification systems occur in different authors, who are sometimes quite removed from each other in interest and audience. This entails that such patterns were current—to some extent at least.

5. *A parallel: Egyptian science*

Hecataeus, Herodotus, and Ctesias show knowledge derived from other cultures, primarily Egyptian. Aristotle follows suit. That such an origin was not a fancy, and that the first Greek classifications of the animal world could date back to a much earlier time than the late fifth century, is corroborated by Egyptian evidence of primary interest. This evidence does not indicate the presence of epistemological reflections such as are to be found in Aristotle, but for this very reason it is important to us, since, as is the case with some treatises of the Hippocratic corpus, it consists mostly of 'handbooks' which reveal eminently practical aims and which have their place at the intersection between medicine and the study of nature: at this same intersection we can therefore locate the main field of origin for systematic zoological research.

From creation stories onward¹³ we can see that in Egypt animals are always listed following the classes to which they were said to belong according to their habitat. After a first division in big- and small-sized livestock, associated with earth, there were three basic categories: animals living in the air (i.e., birds and insects—two groups which, though sharing the same habitat, were regarded as distinct, as the existence of two different ideograms for their names shows); aquatic animals (i.e., fishes); and the group of ophidia and sauria, including lizards and worms, also having a terrestrial habitat. In these kinds of stories we can already see clues leading to the most ancient zoological classifications.

¹³ For western culture, the best known example is the story of the origin of life in the Garden of Eden.

Above all, the classificatory bent and expertise can be identified in works like the so-called veterinary papyrus from Kahun (ca 1850 BC), found together with other scientific (mathematical and medical) texts, in which we have a remarkable wealth of technical terms in the description of symptoms, and also the *onomastica* of Amenemope (ca 1100?) and that of the Ramesseum.¹⁴ These texts, which itemize animals according to classes, bear in their scarce remains detailed descriptions of the anatomical structure of cattle, clearly showing that this was the object of a specific study. Such materials have a marked descriptive-technical character and respond to the same taxonomic bent which is typical of the earliest phase of the study of animals in Greece.

Among the best preserved Egyptian texts of zoological interest is the extraordinary ophiological treatise on papyrus now at the Brooklyn Museum (no. 47.218.48 e 85), dating back probably to the fourth century BC and containing earlier materials.¹⁵ Divided into two sections organically related to each other, the former descriptive, the latter devoted to antidotes, it has a largely homogeneous structure, where each paragraph bears the name of the reptile and family, and a description of morphological characteristics, habits, and the appearance of the bite (sometimes very precisely described, including the number of pricks, the edema or necrosis of tissue, and the wound's width and depth). Also given are its association to a god, effects of the poison, prognosis, and suggestions concerning medical intervention. Clearly written by an author expert not only in snakes but also in medicine, the document was very likely a high-level one, and therefore no text for beginners, but a proper treatise of the sort preserved in temple libraries, in this case in particular, as Sauneron suggested, the library of the temple of Heliopolis (wherefrom it seems the whole lot of papyri originates).¹⁶

¹⁴ On the *Onomastica* see Gardiner (1947) and on a specific section of the *Onomasticon* of the Ramesseum concerning bovids, Dawson (1955). On veterinary treatises see also Kosack (1969). The lists of minerals found on *ostraca* or on the stele from the Egyptian town Sehel should also be mentioned, see Barguet (1953).

¹⁵ See the excellent edition, translation and study of Sauneron (1989), published long after his premature death in 1976.

¹⁶ An outline of the topic is given in the chapter by Betrò (2001). An interesting comparison of Greek and Eastern medicine, particularly medical praxis, has been made by Dietlinde Goltz, in her study of 1974. I dealt with this text, and with the relationship between Greek and Eastern medicine, also in Perilli (2005), with examples from the ophiological treatise, and Perilli (2006), where further bibliographical references can be found.

Here we have a rare example of an ancient zoological handbook, although the aim was not zoological, but medical (Sauneron 1989, 208). It has the purely practical angle typical of handbooks—aiming at the treatment of the consequences of snake bite—yet does not neglect to organize the subject-matter according to the most advanced scientific canons of the time. The efforts of the author to reach a high degree of precision are a sign of the noteworthy scientific attitude of Egyptian doctors and ‘scientists’: ‘les Egyptiens ont du moins franchi un pas considérable dans l’analyse des faits naturels; par leur classification des serpents, par la détermination de leur degré de nocivité; par l’observation des symptômes, et de leur evolution jour après jour’. Although ‘leurs connaissances scientifiques sont encore embryonnaires, et sur certaines points inexactes ... ils ont déjà mis au point et appliqué, dans la recherche des causes et celle des remèdes, *une méthode* qui, elle, garde une valeur éternelle’ (Sauneron 1989, 211, his italics). The relationship between ‘zoology’ and medicine in Egypt confirms that the origin of such treatises is to be looked for in a technical-scientific environment, one that precedes a more philosophical conceptualization as well as any link to the explanation of the structure of the universe, though the categories typical of the latter may have influenced, to some extent at least, the structure of the descriptions. The practical aim, however, and therefore the immediate possibility of a test or refutation of every statement prevents the preconceived application of foreign criteria.

As an expert in the field, Sauneron (1989, 209) remarked that the observations of the Egyptians had gone very far: ‘la nature qui les entourait était soigneusement répertoriée, en dictionnaires techniques, dont nous n’avons guère retrouvé jusqu’ici que des bribes, ou des citations éparses au hasard des traités scientifiques’. It is, however, beyond any doubt that ‘plantes et animaux étaient recensés, décrits, mesurés, et leurs mœurs, ou leurs propriétés étaient notés dans *des encyclopédies à l’usage des médecins*’ (my italics). This picture could also plausibly refer to Greece, where, although philosophical thought had a very different development, there can be little doubt that such inventories did exist with a similar aim—as Hippocr. *De victu* II 46ff. shows. Of these works in Egypt Sauneron says: ‘nous ne pouvons avoir encore qu’une idée très imparfaite; c’était, en somme, la préfiguration des livres des simples, ou des recueils de matière médicale des âges postérieurs’. What can be taken for granted is that the Egyptian doctor who wrote this treatise had a profound knowledge of snakes, while being fully aware

of scientific practice and criteria, as demonstrated by his distinguishing each situation and knowing, as the Hippocrateans did (for instance in the *Prognostic*), that it is necessary to recognise in advance which cases can be successfully treated and which cannot (see Sauneron 1989, 180f., 205f.).

This does not imply that Herodotus or others consulted this kind of treatise, but they certainly used knowledge which had solid roots and was formulated in an adequate way.

6. *Democritus: Thrasyllus and Aelian*

The surviving information concerning Democritus' zoological investigations is rather scanty. His privileged position, at least to our eyes, is due mainly to two elements: on the one hand Aelian's testimony which, though not always convincing, shows the level of detail in Democritus' investigations and, on the other hand, the catalogue of Democritus' writings compiled by Thrasyllus (who could perhaps draw on the materials of the Alexandrian library) preserved in Diogenes Laertius. It informs us of a treatise in three books of Αἰτίαι περὶ ζώων, which is listed among the works called ἀσύντακτα, that is to say *extra ordinem*. Its authenticity has been widely challenged and is still under discussion. The most radical position was perhaps that of Erwin Rohde, who following a 1870 study by Fr. Nietzsche categorically ruled out any chance of attributing the work to Democritus. He thought, with Nietzsche, that ἀσύντακτα meant writings which had been excluded from Thrasyllus' catalogue, and wrote, 'Und wir sollten Schriften, die sogar ein Thrasyll dem Demokrit nicht zutraute, für ächt halten?'.¹⁷ He imagined for these treatises an Alexandrian or even later hand, and elsewhere argued that the medical works mentioned in the catalogue were also the result of a Byzantine forgery.¹⁸ He finally cast doubts on the whole testimony of Aelian on Democritus' zoological observations, since these should have been presumably drawn from the same work (that this was Aelian's source, however, is nothing more than an hypothesis). Later scholars seem to have become persuaded of the contrary in that they believe that *extra ordinem* simply meant 'not better classified' within the imme-

¹⁷ Rohde (1901) I 214f.

¹⁸ See *RhM* 28 (1873) 266f.

diately preceding Φυσιζά,¹⁹ or that if Democritus is not the author, the result is nonetheless Democritean.²⁰ But there is no decisive evidence either way.²¹ Judging from the surviving fragments and testimonies, my opinion is that if Democritus wrote such a treatise, as is at least plausible, it could have had a form similar to the *Problemata* attributed to Aristotle and his school.

It is not too important to know whether or not the information given by Aelian went back to the three books on animal aetiology. We must rather recall that Aelian (whose sources have been the object of the detailed analysis published by Max Wellmann, 'Hermes' 1891, 1892, 1895, 1896, 1916, who perhaps trusted too much in a direct straightforward filiation, and later by R. Keydell, *ibid.* 1937) almost certainly had no direct access to the original texts, but relied largely on intermediate sources. This was an increasingly accepted practice in post-Alexandrian and above all in the Imperial Age. Aelian's sources were both all-important figures such as Aristophanes of Byzantium, and the lexicographer, *excerptor*, and encyclopaedist Pamphilus of Alexandria (2nd half of the first century AD), who with his monumental work—the impact of which is attested by the two subsequent epitomes made from it at short distance one from the other, only a few years after its completion—acted as landmark and source for many later authors including Galen. Mention should also be made of Juba II (1st cent. BC – 1 AD), king of Mauretania by decree of August, who was also a source for Plinius and Plutarch as well as an advocate of the prop-

¹⁹ So e.g. J. Mansfeld in his collection (1987) 585. On the ἀσύντακτα see further the contributions by W. Leszl and A. Brancacci to this volume (pp. 17 and 181).

²⁰ So already Diels (1905) 316.

²¹ Rohde had a radical position about the possibility of distinguishing something genuine among the sentences attributed to Democritus. He thought that 'alle Angaben über Demokrit's Meinungen von Thieren und Pflanzen, welche bei Autoren nach Aristoteles und Theophrast erhalten sind, unterliegen dem Verdachte der Unächtheit', and added a very long footnote, where he pointed among other things at the 'so grosse Menge von Falsa' which was traced back to Democritus, at the number of ethical Sentences 'die dem Demokrit mit Sicherheit abzusprechen sind', at the great amount of γῶμαι that 'nicht nur unter Demokrit's Namen vorkommen, sondern anderswo auch unter den Namen nicht nur des berufenen Demokrates, sondern auch des Chilo, Pythagoras, Solon, Heraclit u.s.w. bis zum Epictet herunter', and so on; and he concluded after his long argumentation: 'woher soll man, nach allen diesen Bedenklichkeiten, den Muth nehmen, einzelne bestimmte Sentenzen dem Demokrit zu belassen, andere ihm abzusprechen? Philologische Methode wird man in den Versuchen zu solcher Sonderung des Achten und Unächten schwerlich bemerken können' (p. 70f. = 215f.).

agation of Greek culture in Northern Africa and the author of many writings rich in historical, geographical, and ethnological information, and also in zoological descriptions of animals typical of those countries (e.g., elephants, lions, etc. in the *Περὶ Λυβίης*). Other sources include Leonidas of Byzantium (1 BC), author of a work on fishes and fishing presumably entitled *Περὶ ἀλιείας*, traces of which are also in Pamphilus, Plutarch and Athenaeus, and, finally, Sostratus (1 BC), whose renown as a zoologist was reputed to be second only to that of Aristotle (see *Athen.* VII 312e). Further, if we accept the reconstruction of Max Wellmann (Wellmann 1891), also Alexander of Myndos (1 AD)—sometimes identified with Alexander Polyhistor, and author of several works of zoological argument, among which was a remarkable *Περὶ ζῴων*.

But Aelian did not use these authors. The information going back to them he took probably from Pamphilus, since Pamphilus had assembled in his encyclopaedic collection most of the technical knowledge then available, comfortably organizing it in *Sachgruppen* and then arranging the items within each group alphabetically (taking into consideration at least the first letter of each word). Aelian did not read Aristotle's original text either; instead he could use the epitome of the zoological works made by the above-mentioned Aristophanes.²² So I tend to dismiss the possibility that he would have read Democritus.

7. *Democritus and the other physiologi*

Let us go back to the question posed at the beginning: what was Democritus' contribution to the study of animals, and how original was it? What we can infer from Aristotle's testimony and from the surviving fragments, is that the Abderite *takes up a position* on current topics, and in doing so follows the same track as his colleagues the naturalists, adding his own suggestions. He is linked to rather than distinguished from them by Aristotle, and this is anything but accidental, as is apparent, for example, from a passage of the small treatise Bekker regarded as autonomous, the *De respiratione* (in the manuscripts, instead, it counts as the last part of the *περὶ νεότητος καὶ γήρως καὶ ζωῆς καὶ θανάτου καὶ ἀναπνοῆς*),²³ from which a rather homogeneous picture can be drawn

²² So A.F. Scholfield in the Loeb Aelian (1971) I XV.

²³ The interesting opening section of *De respiratione* has recently been investigated by Althoff (1999) 78–85.

(470b–471a = A 106 part.): ‘Democritus of Abdera then and some others among them who dealt with respiration did not make any distinction concerning other animals, but seem to speak as if they all breath. Anaxagoras and Diogenes instead explicitly say that all breath, and of fishes and bivalvs that they breath in a certain way, and Anaxagoras declares that fishes, when they send out water through the branchiae, breath in that they attract the air that is formed in the mouth, since there can be no void. According to Diogenes, instead, when they send out water through the branchiae, thanks to the void in their mouth they attract air from the water which surrounds their mouth, as if air were contained in water’. Soon after, an entire section is devoted to Democritus in chapter 4 (471b30–472b); the same will happen with Empedocles in chapter 7 (473a15ff. = Emp. B 100 DK). Elsewhere, Democritus is associated with Empedocles, as at *Gen. an.* II 8 (747a24 = A 149) with regard to the sterility of mules, or to Alcmaeon of Croton, as in Censorinus (5,2 = Alcma. A 13 DK, together with Anaxagoras, against the hypothesis of seed originating from the marrow), and concerning the nourishment of embryos, Pap. Flor. 115, probably to be attributed to Galen,²⁴ where Democritus is coupled with the Crotonian. It is an instance of zoological lore in which Democritus is included, but not with a prominent role.

8. *The contents of the surviving fragments*

The contents of the Democritean fragments confirm this assessment. We must recall that, as in the case of seed or embryos, it is not always possible to distinguish clearly whether Democritus was talking about animals or humans, or both (τὰ ζῷα). Anyway, as far as we can reconstruct *embryology* and *reproduction* were his main topics, with detailed hypotheses concerning the origin of seed, the differentiation of sex, mating, the order of formation of the parts of the embryo, and the nourishment of the embryo.

We also have more or less isolated observations on spiders and the formation of webs; the lion, as the only animal being born with his eyes open; the owl, able to see even at birth; fish, their nourishment, respiration and habitat; dentition; why the cock crows before sunrise;

²⁴ The attribution has been proposed by Manetti (1985).

the origin of life on earth (worms); as well as the significant remarks about the division of animals into bloodless or provided with blood; and the existence of entrails in the former.

The most detailed discussion is preserved by Aelian, and concerns the origin and growth of horns in cervids and bovids.

For the specific zoological contents of all these doctrines Democritus could rely on the investigations of the physicians as well as of the *physiologoi* in general, and to them he refers clearly enough. To judge from our scanty evidence he retrieves both broadly traditional elements, typical of Greek culture since the beginning, and features peculiar to the reflections of (natural) science, particularly those of medicine. It is not a matter of primacy nor of more or less direct relationship, rather one of reconstructing the background so as to reveal Democritus' role.

9. *Democritus and the classification of living beings*

Two important pieces of evidence highlight Democritus' knowledge of the taxonomic categories of the organic world current at the time, along a line which recalls the Hippocratic writings and their tendency towards classification. Aristotle writes (*Part. an.* 3, 665a30 = A 148): ... τῶν δ' ἀναιμῶν οὐδὲν ἔχει σπλάγχνον. Δημόκριτος δ' ἔοικεν οὐ καλῶς διαλαβεῖν περὶ αὐτῶν, εἶπερ ὤνθη διὰ μικρότητα τῶν ἀναιμῶν ζῶων ἄδηλα εἶναι ταῦτα ('... none of the bloodless animals has entrails. Democritus seems not to have judged rightly on this point, if he really thought that the entrails of bloodless animals could not be seen due to their smallness'). Hence the conclusion has often been drawn that Democritus had already classified living beings as ἔναυμα and ἄναυμα, with or without blood (approximately corresponding to vertebrates and invertebrates) and this is very likely, despite Zeller's objections. While there is no evidence that Democritus was the first to introduce the distinction, he probably knew it, since Aristotle gives no hint that it was a personal contribution, and rather seems to take it for granted. The further information given by Galen on this topic (*diff. puls.* I 25 K = B 126) would confirm an interest of Democritus in the invertebrates, 'those living beings which advance with a wave-like movement', ὅσα κυματοειδῶς ἀνὰ τὴν πορείαν πλάζεται (caterpillars).

The second piece of evidence comes from a corrupt text and concerns the subdivision of animal species and their numbers. Pseudo-

Plutarch (= Aet. V 20,1–2, *Dox. Gr.* 432) informs us that Plato and Aristotle had specified four γένη ζώων, *id est* χερσαῖα ἔνυδρα πτηνὰ οὐράνια, since according to them on the one hand καὶ γὰρ τὰ ἄστρο ζῶα, on the other hand the κόσμον is a ζῶον λογικὸν ἀθάνατον. But Democritus, and Epicurus after him, would have excluded the last category, that of the οὐράνια, from the classification. The text, however, has a lacuna at this point, and has only Δημόκριτος Ἐπίκουρος τὰ οὐράνια, which is integrated in Luria's edition with a possible οὐκ ἀποδέχονται ζῶα εἶναι.²⁵ This does not mean that Democritus had developed his own systematization; the same three classes also occur with regard to the Pythagoreans (at least according to Iambl. *vita Pythag.* 31 §207 = I 475,22 DK) and actually correspond to the most elementary categories for the organization of reality. But it demonstrates that Democritus took an active part in the debate, which presupposed a continuous interchange between 'scientific' and 'philosophical' thought.

10. *Embryology, reproduction, heredity.*
Democritus and the medical tradition

Setting aside the isolated and occasional scraps of information from which not much can be gained, and not taking into consideration the improbable (so they were already according to Aulus Gellius, *NA* X 12,6) *mirabilia* preserved by Pliny the Elder,²⁶ some of which is of zoological interest, two areas allow more tenable conclusions. The first is the body of testimonies and fragments concerning embryology and reproduction; the second is the long description of the growth of horns.

As to embryology, the debate had gone on throughout the whole presocratic period, finally converging toward medical writings. In its most technical terms, it goes back to at least Alcmaeon, and later will be found, with different positions, in Empedocles, Anaxagoras, Diogenes of Apollonia, and others, as Aristotle records (*Gen. an.* IV, 763b–764a). From the way in which Aristotle tackles the question, for instance with regard to sex differentiation during the embryo phase (see

²⁵ Diels, *Dox. Gr.* 432 in the apparatus suggested something like οὐκ ἐγκρίνει or μὴ λογικά εἶναι. A comparison for this kind of classification in Democritus is offered by Hermipp. *De astrol.* II 1,12ff. (B 5,2,12ff. DK).

²⁶ Some of them are in DK among the *spuria* to be attributed to Bolus of Mende; a list of the passages is given by Diels in B 300.8, and by Taylor (1996) 135f.

also 723a23 = Emp. B 65 DK), we learn not only how widespread the issue was, but also that the key doctrine was that of Empedocles, which 'must have been typical of the Italic medical school as a whole'.²⁷ To him, Aristotle opposes Democritus, whose thought is also rejected.

The latter is of particular interest in that it shares the so-called 'pangenetic' theory (we owe the term to Charles Darwin, who first used it in 1868),²⁸ which asserts that the seed originates from the whole body, unlike Alcmaeon's and (partly)²⁹ Hippon's encephalo-myelogenic hypothesis, according to which the seed is generated by the brain and the marrow, which according to the ancients were a continuation of one another³⁰—and also unlike the hematogenous theory of Parmenides and Diogenes of Apollonia which later was deloped by Aristotle.

Democritus similarly also deals with the related issue of heredity, both of sex and of morphological features, a central topic on which documentary evidence is assembled and investigated in the rightly famous study of Erna Lesky, published in 1951. Democritus ultimately argued that seed, whose nature is made up of *pneuma* (see Aet. V 4,3 = A 140), derives from all parts of the body, and that there exist a paternal and a maternal seed (Aristot. *Gen. an.* 764a6 = A 143), whose mixing generates the embryo. Sexual differentiation takes place in the embryo phase and is linked to the dominance of the father's or the mother's seed (see Alcmaeon A 14 DK) rather than to the different temperature, hot or cold (Empedocles), or to the left-right distinction (Anaxagoras, Leophanes). This is the *ἐπιζωότατα* theory, entailing the dominance of one part of the seed on the other, a theory to be found already in Alcmaeon and to which Democritus gives a new content, according to which it no longer has to do with the general dominance of the contribution of one of the parents, but with the dominance of the specific part of seed coming from the reproductive system.³¹

²⁷ Lanza (1971) 971 n.

²⁸ The term has been used rather freely with regard to ancient theories, considering only its more general meaning. To give an idea of the exact meaning, I quote here the definition as can be read in the Merriam-Webster Dictionary, under the heading 'pangenesis': 'a hypothetical mechanism of heredity in which the cells throw off pangens that circulate freely throughout the system, multiply by subdivision, and collect in the reproductive products or in buds so that the egg or bud contains pangens from all parts of the parent or parents'.

²⁹ On Hippo see, however, Lesky (1951) 1236.

³⁰ See Guthrie (1965) II 356n.

³¹ See Lesky (1951) 1297, Stückelberger (1984) 62.

The Democritean theory is very interesting, indicating a precise angle as well as a connection between Democritus' biological reflections and his more general atomistic view, in that it anticipates Aristotle by asserting that the umbilical cord, not the head or the heart, is the first to be formed in the embryo. The head and heart had been given this primacy due to the idea that the most important organs must also be the first to be formed in chronological order; the umbilical cord, according to Democritus, offers the foetus support for its growth, providing an 'anchorage' (Plut. *am. prol.* 495e = B 148, cf. Aristot. *Gen. an.* 745b25). After the cord, the external part would take shape, especially the head and abdomen due to the larger area of void in them—a typical atomistic and physicalist argument.

The embryo in the womb feeds by sucking, while the newborn infant has the instinct and the ability to suck its mother's breast (Aet. V 16 = A 144). A detail links this hypothesis to research concerning mammals other than man since these, and ruminants in particular, have tiny fleshy outgrowths inside their abdomen (cotyledons) which are not found in humans, and from these the theory is likely to have started. This same hypothesis occurs in the sixth chapter of the Hippocratic *De carnibus*, a medical-cosmological treatise of particular interest, the only surviving case of a scientific-philosophical treatise from the end of the fifth century giving an idea of what 'presocratic' writings probably looked like, in which the embryo is explicitly said to suck in both nourishment and air through the mouth. This experience allows him, once born, to get nourishment from his mother. The idea was perhaps already one of Alcmaeon, if we can trust what Oribasius (III 56) records from Rufus (Alcm. A 17 DK). Further details on the Democritean vision about the causes of abortion (Aelian. *NA* XII 17 = A 152), multiple births and the sterility of mules, which, being an artificial product of man, have a malformed genital duct (Aelian. *NA* XII 16 = A 151) belong to the same field.

Democritus' pangenetic and embryological views and his related belief about hereditary characters are to be found also in other treatises of the Hippocratic corpus. On one hand we have *De aëribus* and *De morbo sacro*, whose epistemological importance is especially well known, and on the other hand the more technical so-called 'Cnidian' group, *De genitura*, *De natura pueri*, *De morbis IV* (usually considered as a whole, at least since Littré's edition of Hippocrates, and probably one and the same work; I. Lonie, who wrote a commentary on these works, thought that *De morbis IV* was a separate piece, but by the same author). It is in

these treatises that the topic is more closely examined.³² Democritus is not likely to have elaborated the theory, passing it on to the physicians, as has been argued;³³ this is not very plausible given also what has been said above about the 'zoological' investigations in the Hippocratic writ-

³² Cf. R. Joly (1966) e (1970); Lesky 1951, 76ff.; Stückelberger (1984) 57ff.; the commentary by I.M. Lonie was published in 1981, on our topic see 115ff. On embryology and heredity see also Balss (1936), as well as Geurts (1941), and De Ley (1970), (1971–1972), (1980), and, with regard to Aristotle, at least Kullmann (1979).

³³ Wellmann (1929) (we know that Wellmann, whose merits in the study of ancient medicine are common knowledge, was inclined to optimism as regards the possibility of tracing a theory back to its ultimate source, as can be seen both in his above-mentioned studies on Aelian's sources and in his book on the *Hippokratesglossare*, as well as in some of the articles he wrote for the *Realencyclopädie*); Geurts (1941) 65; Lesky (1951) e.g., 1300 n. 3 et passim; Lopez-Ferez (1981). Lonie (1981) e.g. 116, et passim, follows Lesky and goes a little further, saying that even *De morbo sacro* and *De aëribus* could have been influenced by Democritus. Concerning pangenesis and heredity, he says, 'in both treatises, the authors merely make use of a theory which they seem to regard as established, whereas it is the purpose of *Genit.* to establish it; it is therefore tempting to regard *Genit.* as the earlier work, on which *Morb. Sacr.* and *Aer.* depend. All three, however, might depend on a common source, possibly Democritus, since he alone among the presocratic philosophers is credited with the theory. Lesky suggests that the hypothesis was taken over from Democritus by the medical writers, who based it on their humoral theory, while in Democritus it was based on the body tissues. If so, it would be an interesting example of a specifically medical application of a more general theory' (Lonie, 116). Lonie's work is sound and detailed, but this hypothesis sounds chronologically difficult and is influenced by the common idea of an a-priori primacy of Presocratics over the medical doctors (i.e., of philosophy over medicine, insofar as it is possible to distinguish them clearly), so that an author (Democritus) of whose biological theories we only have scanty and indirect information, is proposed ('since he alone among the presocratic philosophers is credited with the theory') as the source of contemporary or later developments. I also believe it unlikely that a 'specifically medical application' could have come out 'of a more general theory', namely a philosophical one. If any *direct* relationship is to be assumed (and it cannot be taken for granted), it will have been rather the opposite, considering that, unlike the philosophers, the doctors had an immediate and crucial test—the life or death, health or illness, of the patient. Althoff (1999) 86 seems to accept, *en passant*, Lesky's position, deeming it likely, however, that Aristotle in his discussion of the pangenetic theory directly followed the Hippocratic 'Cnidian' writings, as also Föllinger (1996) 144 n. 159 suggests, and Coles (1995) argued in detail concerning the notion of seed and its origin from the liquid nutriment in the body. A close examination of the association of Democritus with the 'Cnidian' treatises is in Salem (1996) 224–252, who starts from Wellmann's position and ends up with the hypothesis—to me unlikely—of 'innumerable debts' of rational medicine to Democritus. Naturally enough, as in the case of Salem (cf. p. 229 and n. 6), there is a tendency to obliterate the fact that the most likely date for the 'Cnidian' treatises is not the one proposed by Wellmann (350BC), which indeed is fairly improbable given the archaic character of the style and the absence of any point of contact with theories later than the end of the fifth century, but rather the one which locates them not later than the end of the fifth century, and possibly a few years earlier (Joly himself, 1970, 23, revealingly enough states 'on sera *forcé*

ings and in Democritus. I give up here any subjective arguments—though being convinced of them—according to which the hypothesis of a direct doctrinal influence exerted by philosophical notions on medicine concerning such very specific and technical topics would be in itself unlikely, considering also ‘Hippocrates’ attitude (e.g., in *De vetere medicina*).³⁴ A different conclusion could be admitted for more general views, for the major philosophical problems about the world and man (as, for instance, the theory of the four elements), which medical authors could have used in their writings whenever they needed a frame for the more specific discussion. Philosophy and medicine in antiquity have almost always been closely related to each other, although Hippocrates is credited by Celsus, in his *Prooemium* to the *De medicina*, with having ‘separated medicine from philosophy’. But I think we could apply also to earlier times what F. Kudlien (1970, 16) states about Hellenistic medicine and the idea of the physician as a philosopher,

d’admettre la datation traditionnellement reçue: la fin du Ve siècle’; Jouanna, 1992, 541, proposes the end of fifth to the beginning of the fourth century). Not much is added by the similarities to Democritus, which are to be seen in the Hippocratic *De carnibus* on the same topics, and these could even support the opposite conclusion, since that treatise too is most plausibly dated by the editors (both Deichgräber and Joly) towards the end of the fifth century. We should add, however, that in this case we have a piece which is half way between a presocratic treatise and a specialist medical work, following a line leading from Empedocles to Diogenes of Apollonia, an example of a *περὶ φύσεως* treatise concerning the formation of man (using the analogy of the cosmos) and his parts, and how organs of sense work. It would be easy to imagine this kind of work as the link between medical literature proper, aiming at handbooks or perhaps at an immediate applicative outcome, and a thinker like Democritus, who (presumably) had quite different goals.

³⁴ A similar position was held by Baldry (1932) 28 who, while investigating the undeniable kinship of the embryological ideas of physicians and the cosmological theories of philosophers, observed: ‘some aspects of early cosmogony can be properly understood only by comparison with embryological beliefs of the kind here expressed. ... [T]he only possible conclusion is that similar doctrines to those of *περὶ φύσεως παιδίων*, if perhaps in a simpler form, were already held in the time of the earliest philosophers, since it is scarcely conceivable that the medical writers should have founded their theories—theories tallying roughly with observation—on an analogy with the cosmogony of the century before last’. Democritus’ fragment 32 too (*Ξυνουσίη ἀποπληξίη σμικρή, κτλ.*) may reveal a medical origin, if we are to credit Stobaeus III 6,28, who traces it back to Eryximachus, the physician (known almost exclusively through Plato): *Ἐρυξίμαχος τὴν συνουσίαν μικρὰν ἐπιληψίαν ἔλεγεν καὶ χρόνῳ μόνῳ διαλλάττειν*. Gellius (*NA* XIX 2) attributes it to Hippocrates in person (*namque ipsius verba haec traduntur τὴν συνουσίαν εἶναι μικρὰν ἐπιληψίαν*). Perhaps the pseudo-Galen of the *Definitiones* correctly attributes to Democritus only the second part of the fragment, as edited by DK (XIX 499 K: *ὁ μὲν Δ. λέγων· ἄνθρωπος ἐξέσσεται ἐξ ἀνθρώπου παντός*, cf. Gal. *An animal sit quod est in utero* XIX 176 K). On this fragment see also Gemelli in this volume, p. 215ff.

namely that 'the philosopher ... being himself interested in science and medicine ... could give ideas and mental stimuli to an interested physician'. At the beginning of 'scientific' medicine, one could resort to philosophy in search of a theoretical foundation, not of technical knowledge (cf. Kudlien, 5). There are two radically opposing parties: philosophers as a rule see an influence of Democritus on medical treatises concerning specific aspects, while historians of medicine usually tend to exclude it. I subscribe to the latter view.

Moreover, when investigations go beyond generalization (such as: 'Democritus asserted a pangenetic theory; *ergo* anybody else sharing it, contemporary or successor, depends on him') and become more detailed, the results are unambiguous, as is shown by Stückelberger's broadly negative examination of the evidence assembled by Wellmann in view of the hypothesis that medical works depend on Democritus.³⁵ Among the many similarities, investigated one by one, only in a few, often unimportant, cases can a knowledge of Democritus' doctrine be assumed on the part of the Hippocratic authors, while elsewhere, and for the most important theories, we can detect no more than conceptual or terminological analogies. More caution should also be suggested by the poverty of the evidence attributed to Democritus, sometimes only consisting in vague hints, so that no conclusion can be drawn.³⁶ As far as I can see this position tallies with Lonie's conclusion

³⁵ Wellmann (1929); Stückelberger (1984), in the chapter entitled 'Spuren Demokrits im Corpus Hippocraticum' (pp. 49–87).

³⁶ I find, for example, that Jouanna's skepticism should be shared, when he (Jouanna 1992, 386f.) remarks how scholars, after having ascertained a parallelism between doctors and philosophers on embryological topics, usually tried to establish debts owed by doctors to philosophers, resorting to all available names: Empedocles, Anaxagoras, Diogenes of Apollonia, the Pythagoreans, and, above all, Democritus, of whose most peculiar atomistic doctrine, however, no trace can be found in the treatises at issue, nor have we any information concerning Democritus as the first to have elaborated any of these theories: 'Il semble donc que les érudits cèdent, encore plus que les anciens Grecs, au mirage du premier inventeur. ... Notre connaissance de l'embryologie [and not only embryology] des Présocratiques est très indirecte et très parcellaire ... sans compter que l'essor des recherches sur l'embryon chez les philosophes présocratiques peut aussi bien s'expliquer par une influence de la pensée médicale. Il y a eu, très vraisemblablement, des influences réciproques qu'il n'est plus possible de démêler'. I would, as already stated, be even more radical in assuming a one-way relationship—for those cases in which the hypothesis of a relationship is allowed—from doctors *towards* Democritus. This applies at least to the more specific theories, while concerning the complexity of the philosophical and scientific debate in the fifth century, one must be rather cautious, as argued by Temkin 1955. The difficulties in this regard are also clear to Lonie (cf. his chapter 'Relation of the treatise to the pre-Socratic philosophers', 62–70), who is,

(1981, 65), shared by Althoff (1999, 87), that Aristotle's 'doxographic' reconstruction concerning pangenesis seems to be directed not against a single forerunner, but against a widespread opinion: 'the impression left by the passage in Aristotle is that he is arguing not against a particular opponent but against a well-known view which had been frequently canvassed and supported by various arguments in more or less public debate' (Lonie, l.c.).

As regards 'Hippocrates', the first difficulty is chronological. Although there can be no certainty, the *De aëribus* has been dated around 430BC,³⁷ and the *De morbo sacro* not far away, probably only a few years later, when Democritus' doctrine is not likely to have been so mature and widespread as to be used *tout court* in medical literature. A second difficulty lies in the summary way in which both *De aëribus* and *De morbo sacro* mention the doctrine: *Aër.* XIV 4 Jouanna (= XIV Jones) ὁ γὰρ γόνος πανταχόθεν ἔρχεται τοῦ σώματος, ἀπό τε τῶν ὑγερῶν ὑγερὸς ἀπό τε τῶν νοσερῶν νοσερός, *MSac.* II 2 Jouanna (= V Jones) ὡς ὁ γόνος ἔρχεται πάντοθεν τοῦ σώματος, ἀπό τε τῶν ὑγερῶν ὑγερὸς καὶ ἀπὸ τῶν νοσερῶν νοσερός. Both times the statement, which in itself would seem elementary, closes and grounds detailed arguments concerning the heredity of acquired somatic traits, or pathologies. The brief and, I would say, scholastic formulation of the doctrine suggests that it was common among doctors around 430BC. It is taken for granted, and used to confirm other, more specific, assertions as the explanatory γὰρ of the first text shows, and the technical character of the context makes an origin in Democritus (*pace* Diller) unlikely. The same can be said for other hypotheses, such as that substituting Anaxagoras for

however, convinced that 'the influence of Democritus seems ... to pervade the whole treatise', but specifies that 'it is more because of this generally mechanistic approach than of any particular feature' (70), and also remarks that other contributions are to be taken into account. So far, Lonie's position is well-grounded and could be easily shared, although I still have some reservations (also concerning the spread and knowledge of Democritus' doctrine in the last decades of the fifth century). The difficulties and at times errors hidden in the attempts to establish these kinds of comparisons and influences, among which are some of those made by Lesky and other later scholars, have already been dealt with. I mention here only J. Jouanna's contribution to the Hippocratic Colloquium of 1992 and A. Thivel's to that of 1996, the latter clearly restating, after recalling Jouanna's (1992) investigation, that 'die pangenetische Theorie ist durchaus kein Werk der Atomisten; denn sie war lange vor ihnen vorhanden, und die Atomisten sind nur Vertreter derselben, neben anderen' (66).

³⁷ Heinimann (1945) 170ff. ('Anhang'); Jouanna, ed. CUF; so already Wilamowitz and Nestle; Vegetti (1976, 191) proposes the interval 430–410.

Democritus.³⁸ One may further note, though only marginally,³⁹ that *De aëribus* bears no trace or echo of peculiarly Democritean doctrines, primarily atomism, and that the Democritean materialistic bent seems to be far removed from the attention paid to religion and the sacred by the Hippocratean author, whom Diller was inclined to locate in the Democritean circle.⁴⁰ The sheer sharing of an aetiological perspective cannot lead to such a strong relation as proposed by Diller.

The 'more rich and differentiated'⁴¹ image offered by the so-called Cnidian treatises (I stick to this controversial name, for the sake of convenience) is to be chronologically located at the end of the century. It shares with Democritus' doctrine both the theory of pangenesis and the notion of sex-differentiation as due to two seeds, male and female, and to the dominance of the one over the other, as well as the idea that fertilization takes place when the two seeds meet. Also, the belief of *pneuma* as the cause of growth (particularly of the embryo) is similar to Democritus', but this theory is to be found elsewhere in medical writings too. In spite of all similarities, however, there is a fundamental difference: while the atomistic pangenetic explanation revolved around the notion of the atom and its characteristics (to the extent that Lesky proposed a comparison with Darwin's gemmules),⁴² that is to say that it moved on a physical, or physicist, basis, the medical treatises have a purely physiological and nosological angle, relating the hypothesis of pangenesis to the humoral doctrine typical of the whole Hippocratic corpus—despite all the variations occurring in the different treatises before its codification in the *De natura hominis*, and going through the whole history of ancient medicine up to Galen and, through him, to the following centuries. Humours (the specific object of *De morbis IV* since its very beginning, see also *genit.* I 1, III 1) as a whole form the basic ὑγρόν of the body, and thus originate seed, diseases, and their heredity, since they are transmitted from one generation to the following without changing their characteristics.⁴³

³⁸ Cf. e.g. Vegetti (1976) 218.

³⁹ With Pohlenz (1938) 27.

⁴⁰ Diller (1934) 64f.

⁴¹ Lesky (1951) 1301.

⁴² In the theory of pangenesis, gemmules are minute, self-multiplying particles considered to be transmitted from somatic to germ cells and to mediate in a new individual the production of cells like those in which they originated.

⁴³ It is not possible to investigate here the connections between *De aëribus* and *De morbo sacro* on the one hand, and those of *De genitura*, *De natura pueri*, and *De morbis IV* on the other. See, for example, Lesky (1951) 1304f. n. 2. It should be noted that con-

Democritus' original contribution is to be found elsewhere. As Lesky points out (p. 1295), until then matter in general, and the human body in particular, had been assigned multiple qualities (hard or soft, thin or thick, etc.); atomism adds the qualities of form and dimension, which become decisive for living organisms as well as for any other thing (the ἄτομοι ἰδέαι of Plut. *adv. Col.* VIII, 1110F = A 57). The introduction of the concept of atom gives also to biology the notion of a minimum morphological unit, to which one could resort, for example, to explain the much discussed question of heredity.

Not only does the idea of the four humours introduce a substantial change compared to Democritus, but also the related notion (on which see *nat. puer.* XVII 1) of the heredity of tissues—generally classified as ὑγρόν and above all πυκνόν and ἀραιόν, terms important for the atomists too, but not for them only—according to the principle of the *simile cum simili*, that is, each tissue having its own characteristics passing on to the embryo through the seed. Most interesting perhaps is that the Hippocratean who wrote these treatises explicitly states the empirical, if not experimental, method he used to get his results. He says he has observed an early, deliberately induced abortion (*nat. puer.* XIII) and the hatching of twenty eggs at an interval of one day, one from the other (ib. XXIX). He is fully aware of the methodical significance of what he says, since at the end of the first case he states its role in order to validate his assertions: it is a ἰστόριον παντὶ τῷ ἐμῷ λόγῳ, ὅτι ἐστὶν ἀληθές (XIII 4), a proper *proof*, which in order to be expressed requires a specific term, ἰστόριον, as rare in Greek as it is peculiar to 'Hippocrates'.⁴⁴ This again marks the distance from Democritus,

cerning the origin of seed Coles (1995) 50 remarks that Aristotle was himself extensively influenced by the 'Cnidian' treatises; he also accepts Lonie's position that these treatises show the influence of Democritus. It is again on the basis (to me uncertain, see above nn. 33 and 36) of the assumed Democritean influence that Lonie (71) proposes as a *terminus post quem* the date of 420 BC for these works, which date is the most likely.

⁴⁴ It should not escape notice, however, that although this sort of experimental test has for a long time been rightly admired, it is adopted by the author to confirm a clearly erroneous idea of the formation of embryos, in which the a-priori element plays an important role. I confine myself to R. Joly's remarks in the introductory *Notice* to his edition, 28–33; more generally, about the scientific method of the author, strongly lessened compared to a sometimes exaggerated enthusiasm, see Joly (1966) 70–119 (with some bibliographic references: also R. Burckhardt, mentioned above with regard to the pre-Aristotelian *Tiersystem*, counted among the admirers of the no doubt surprising experiment of the eggs). But, although it is true that the data of the Hippocratean are incorrect and that apriorism still plays an important role in the treatises at issue, and although it is above all undoubtedly incorrect to search for

compared to which Aristotle himself takes advantage when he observes (in the previously mentioned *Part. an.* 665a30ff.) that the σπλάγχνα, although very small, can nevertheless be seen by anyone observing an aborted embryo, and he criticizes Democritus for having said that the smallness prevented direct observation. It is a remarkable issue since, even though we know that Democritus also used to resort to ‘experiments’ (such as the unsuccessful one on removing salt from sea water),⁴⁵ he seems to share with the author of the Hippocratic work *De victu* also the tendency towards a purely rational development of available data.⁴⁶

Democritus is not at the origin of the doctrines at issue. He rather follows not only the results of medicine, but also the ancient traditions and popular wisdom and beliefs, when he says that, well, seed comes from the whole body, but specifies, καὶ τῶν κυριοτάτων μερῶν, οἷον ὀστέων σαρκῶν καὶ ἰνῶν (Aet. V 3,6 = A 141), namely, in particular from the most important parts: bones, flesh, and sinews. That is to say—as Odysseus learns from his mother in Homer’s *Nekyia*, in *Odyssey* XI—exactly the three parts of which mortals are deprived in Hades, being pure εἶδωλα, οὐ γὰρ ἔτι σάρκας τε καὶ ὀστέα ἵνες ἔχουσιν (λ 219). These are the vital parts, wherefrom, according to the Greeks, the principle of life derives, the seed, whose role in Greek culture and religion is of paramount importance from the earliest time and which is related to numerous rituals.⁴⁷ The conceptual distance from Democritus is further

forerunners of modern science in antiquity, nonetheless, Joly’s criticism appears to be somewhat ungenerous, since the epistemological awareness of these writings, with all its limits, is unquestionable. The claiming of epistemological merits and primacies is due to modern interpreters, not to the ancient author.

⁴⁵ Aristotle speaks of the experiment and recommends it (*Hist. an.* VIII 2, 590a18, sim. *Meteor.* II 3, 358b35). Aelian traces it back to Democritus, see IX 64. Cf. Diels (1904) 312f.; Preus (1975) 22f., 268. A useful annotated survey of 32 ‘experiments’ of the Hippocratic corpus, compared with other authors, is found in Senn (1929).

⁴⁶ An instance of it is in *vict.* II 47, where birds are said to be more dry, ξηρότερα, compared to quadrupeds, because the absence of a bladder entails the absence of urine and spittle. Their stomach is warm, and to remain so it uses the body’s moisture, so that, as the author repeats, they neither urinate nor spit. He adds: ἐν οἷῳ δὲ μὴ ἔνι τοιαύτῃ ὑγρασίῃ, ξηρὰ εἶναι ἀνάγκη. This conclusive and more general ‘necessity’, according to which an animal lacking in such moisture must fall within the ξηρά category, is removed from any empirical perspective, and not really justified apart from its being logically consistent with the argument. Although, as has been observed in note 44, the three ‘Cnidian’ treatises also make use of unparalleled elements, the effort of finding test criteria is, in that author, manifestly greater.

⁴⁷ Cf. Onians (1951), *passim*, see Index, s.vv.

emphasized in the *De genitura*, which stresses instead, in the same idea of pangenesis, the brain and marrow as the dominant parts.

Democritus performs an unusual association of common knowledge and scientific knowledge, as we shall see again in the other topic on which we have sufficient details: horns.

11. *The growth of horns*

Democritus' way of tackling the issue of the origin and growth of horns in cervids and bovids confirms his perspective and his position in the development of Greek scientific thought, as well as his relationship to medical treatises, by which he seems to be strongly influenced. Aelian (XII 18–20 = A 153–155), by devoting three chapters to it, furnishes a wealth of details on a topic which may seem to be, but is not at all, unimportant.

Democritus' work in this area reveals remarkable attention to the processes of animal anatomy and physiology, explaining how the veins running throughout the animal's body become increasingly thicker as they get closer to the head and especially at its top. The veins are porous, as is the thin and membranaceous bone containing the brain (the mention of the latter is not accidental). The head gets nourishment and reproductive power from the veins, while the strength of the nourishment (ἡ ἰσχύς τῆς τροφῆς) approaches it by means of them. Hence, from the outcrop of wet matter, horns begin to grow, being supplied by the humour (ἰκμάς), which forces outwards what precedes it. The wet matter (ύγρόν), once out of the body, hardens (σκληρόν), thanks to the air which renders it compact and horny. The outer part hardens with the cold, the inner one remains soft because of heat. In chapter 19 Democritus is said to have maintained (rightly, according to Darwin, *Descent of man*, II 17, ap. Onians 1951, 239 = 288 ital. ed.) that castrated oxen have differently-shaped horns which are long, thin and hooked, as opposed to having the normal shape, which is large at the base and also straight and shorter. Finally (chapter 20), the absence of horns in some oxen is explained by the lack of 'alveolation' of the frontal bone, and by the characteristics of the whole cranium, impervious and therefore unfit to receive the humours reaching it and to let them pass through. Aelian concludes, 'in short, the afflux of these (humours) is the cause of horns' growth, and the veins conveying this afflux are very many and big, and they secrete as much humour as they can contain'.

This long discussion has a twofold meaning. First, it shows that the conclusions are not based on empirical control, but on an inductive-deductive process (since it would have been easy to ascertain that horns, and particularly those of cervids, are indeed purely bony formations, coated by an epidermal integument, whereas bovids' horns, though being themselves made of bone, are coated by a corneous case which could better justify an explanation like the one given by Democritus). Secondly, it has been overlooked (to my knowledge) that Democritus' explanation of the growth of horns basically depends on the investigations of his contemporaries the doctors, as stated, e.g., in the *De morbo sacro* itself, whose importance we have already seen.

Let us declare beforehand that a Democritean influence on the Hippocratic treatises concerning this topic is unlikely, since the latter are much more detailed and systematic and are clearly and professedly based on direct observation. Democritus seems to pick up and reuse arguments of this kind (not necessarily the one of *De morbo sacro*, although the similarity is striking); he sums up their content, merely reporting the main points—even though in such comparisons it is necessary to remark more than ever that, as regards language, Aelian's testimony probably is not very faithful to the original.

A few examples are in order. When the author of *De morbo sacro* wants to argue against what he considers the error of traditional belief, specifically that they assign to the so-called 'sacred disease' a divine origin, he asserts that the cause of epilepsy, as of all other major diseases, lies in the brain; in so doing, he illustrates the brain's anatomy, starting from his own observations of animals and transferring the results to humans on the usual analogical basis, as had already happened in Alcmaeon for his investigations on the brains of animals (see A 5–11), especially goats (if we must refer to the brain A 7 = Aristot. *Hist. an.* I 11, 492a13). The veins' route (see the texts in footnote 48), described with a wealth of details in the Hippocratic treatise, is in Democritus summed up with the cursory attitude of someone not very interested in technicalities, who confines himself to the beginning clause (*MSac.* καὶ φλέβες δ' ἐξ αὐτὸν τείνουσιν ἐξ ἅπαντος τοῦ σώματος, cf. Democr. τὰς φλέβας δὲ αὐτῶν τὰς διὰ τοῦ σώματος πεφυκνίας παντός). Such veins are πολλαὶ καὶ λεπταί (numerous and thin) according to the Hippocratic, ἀραισιτάτας (very thin, porous) according to Democritus. In both authors they go towards the brain, τὸν ἐγκέφαλον (the mention of which in Democritus is all the more significant since it is not immediately relevant to the argument), which is divided by a thin membrane (μῆνιγξ λεπτή) for the

Hippocratic, whereas for Democritus it is surrounded by a membrana-cous, light, porous bone (ὁστέον ... λεπτότατον εἶναι καὶ ὑμενώδες καὶ ἀραιόν)—an observation recalling the more general anatomic notions of doctors, cf. *Loc. hom.* Π 5 τῆς μήνιγγος ... τῆς περὶ τὸν ἐγκέφαλον περιεταμένης, see further I 18, as well as *Vuln. cap.* Π 4 ξυμπάσης τῆς κεφαλῆς τὸ ὁστέον λεπτότατόν ἐστιν ..., καὶ ὁ ἐγκέφαλος κατὰ τοῦτο τῆς κεφαλῆς πλείστος ὕπεστιν, Π 17 ὑπὸ λεπτοτάτῳ γὰρ ὁστέῳ ἐστὶ ταύτῃ ὁ ἐγκέφαλος. According to Democritus, the veins going towards the top of the head become thicker (παχυτάτας), as, again, the author of the Hippocratic *De morbo sacro* had already said: τὸ μὲν παχύτατον καὶ μέγιστον καὶ κοιλότατον ἐς τὸν ἐγκέφαλον τελευτᾷ.⁴⁸ The concept of ὑγρόν, too,

⁴⁸ I give the texts in full (the Democritean one only as far as it is of interest here). Hippocr. *De morbo sacro* III 2–5 Jouanna (= ch. VI Jones): ὁ ἐγκέφαλός ἐστι τοῦ ἀνθρώπου διπλός ὥστε καὶ τοῖσιν ἄλλοις ζῴοις τὸ δὲ μέσον αὐτοῦ διεργεῖ μὴνιγξ λεπτή· διότι οὐκ αἰεὶ κατὰ τὸ αὐτὸ τῆς κεφαλῆς ἀλγεῖ... Καὶ φλέβες δ' ἐς αὐτὸν τείνουσιν ἐξ ἅπαντος τοῦ σώματος πολλὰ καὶ λεπταί, δύο δὲ παχεῖαι, ἡ μὲν ἀπὸ τοῦ ἥπατος, ἡ δὲ ἀπὸ τοῦ σπληνός. Καὶ ἡ μὲν ἀπὸ τοῦ ἥπατος ὧδ' ἔχει· τὸ μὲν τι τῆς φλεβός κάτω τείνει διὰ τῶν ἐπὶ δεξιᾷ παρ' αὐτὸν τὸν νεφρὸν καὶ τὴν ψοφὴν ἐς τὸ ἐντὸς τοῦ μηροῦ καὶ καθήκει ἐς τὸν πόδα καὶ καλεῖται κοίλῃ φλέψ· ἡ ἐτέρη ἄνω τείνει διὰ τῶν φρενῶν καὶ τοῦ πλεῦμονος τῶν δεξιῶν, ἀπέσχισται δὲ καὶ ἐς τὴν καρδίην καὶ ἐς τὸν βραχίονα τὸν δεξιόν, καὶ τὸ λοιπὸν ἄνω φέρει διὰ τῆς κληῖδος ἐς τὰ δεξιὰ τοῦ αὐχένος ἐς αὐτὸ τὸ δέρμα ὥστε κατὰδηλος εἶναι, παρ' αὐτὸ δὲ τὸ οὖς κρύπτεται καὶ ἐνταῦθα σჩίζεται· καὶ τὸ μὲν παχύτατον καὶ μέγιστον καὶ κοιλότατον ἐς τὸν ἐγκέφαλον τελευτᾷ, τὸ δὲ ἐς τὸ οὖς τὸ δεξιόν, τὸ δὲ ἐς τὸν ὀφθαλμὸν τὸν δεξιόν, τὸ δ' ἐς τὸν μυκτήρα. Ἀπὸ μὲν τοῦ ἥπατος οὕτως ἔχει τὰ τῶν φλεβῶν διατέταται δὲ καὶ ἀπὸ τοῦ σπληνός φλέψ· ἐς τὰ ἀριστερά καὶ κάτω καὶ ἄνω, ὥστε καὶ ἡ ἀπὸ τοῦ ἥπατος, λεπτοτέρη δὲ καὶ ἀσθενεστέρα. ('The brain of man, like that of all animals, is double, being parted down its centre by a thin membrane. For this reason pain is not always felt in the same part of the head ... Veins lead up to it from all the body, many of which are thin, while two are stout, one coming from the liver, the other from the spleen. The vein from the liver is as follows. One part of it stretches downwards on the right side, close by the kidney and the loin, to the inner part of the thigh, reaching down to the foot; it is called the hollow vein. The other part of it stretches upwards through the diaphragm and lung to the right. It branches away to the heart and the right arm. The rest leads upwards through the collar-bone to the right of the neck, to the very skin, so as to be visible. Right by the ear it hides itself, and here it branches, the thickest, largest and most capacious part ending in the brain, another in the right ear, another in the right eye, and the last in the nostril. Such is the character of the veins from the liver. From the spleen too extends a vein downwards and upwards to the left; it is similar to the one from the liver, but thinner and weaker'. Transl. Jones, with changes). Democr. A 153 (= Aelian. *NA* XII 18): αἰτίαν δὲ ὁ αὐτὸς λέγει τοῖς ἐλάφοις τῆς τῶν κεράτων ἀναφύσεως ἐκείνην εἶναι. ἡ γαστήρ αὐτοῖς ὥς ἐστι θερμωτάτη ὁμολογεῖ, καὶ τὰς φλέβας δὲ αὐτῶν τὰς διὰ τοῦ σώματος πεφνικίας παντὸς ἀραιωτάτας λέγει καὶ τὸ ὁστέον τὸ κατευληγὸς τὸν ἐγκέφαλον λεπτότατον εἶναι καὶ ὑμενώδες καὶ ἀραιόν, φλέβας τε ἐντεῦθεν καὶ ἐς ἄκραν τὴν κεφαλὴν ὑπανίσχειν παχυτάτας. τὴν γοῦν τροφὴν καὶ ταύτης γε τὸ γονιμώτατον ὥκιστα ἀναδιδόσθαι καὶ ἡ μὲν πιμελή αὐτοῖς ἔξωθεν, φησί, περιχεῖται, ἡ δὲ ἰσχύς τῆς τροφῆς ἐς τὴν κεφαλὴν διὰ τῶν φλεβῶν ἀναθρόννται. ἐνθεν οὖν τὰ κέρατα ἐκφύεσθαι διὰ πολλῆς ἐπαρδόμενα τῆς ἱκμάδος... ('And the same writer says that the

is typical of this Hippocratic treatise and of other texts of the corpus, such as the one of heat inside the belly, but in this case the kinship is too generic to draw any conclusion.

Unlike Democritus' sometimes fanciful description, the author of *De morbo sacro*, like his colleague of the aforesaid *De natura pueri*, unambiguously declares that the source of his information lies in direct investigations, thus earning a remarkable esteem: XI 4 ἦν διακόψας ὄρῳς τὴν κεφαλὴν, εὐρήσεις κτλ. (the reference is to goats). The heuristic value lies in opening the animal's head and making personal observations.

Democritus, as I was saying, seems to pick up data coming from the most up-to-date investigations in order to obtain reliable means to explain various and more general phenomena. The topic of horns, seemingly a minor one, is indeed recurrent from the very outset of Greek culture (as it was already in Egypt). The symbolic value of horns is very high; they are assigned honours particular to them, even sometimes being coated with gold (Hom. γ 437f., 384, K 294). In Minoan-Mycenaean times they were already regarded as sacred⁴⁹ and placed on altars, which could even be entirely made of horns, as was the case at Delos (see Onians 1951, 238 = 287 ital. ed.). The sacred meaning can be explained by considering that horns represented (and here Democritus should be recalled) an outcrop of the head's vital substance: seed, which embodies force, and derived according to some theories from the ἐγκέφαλος. What is born from the head is an emergence of what is inside; the etymological connection of κέρας and *cerebrum*, cf. germ. *Hirn*, angl. *horn*, etc. will have been far from incidental. For all this, Democritus, with the help of medicine, attempts an anatomical and physiological explanation.

reason why deer grow horns is as follows. He agrees that their stomach is extremely hot, and that *the veins throughout their entire body are extremely fine*, while the bone containing the brain is extremely thin, like a membrane, and loose in texture, and the veins that rise from it to the crown of the head are extremely thick. The food at all events, or at any rate the most productive part of it, is distributed through the body at great speed: the fatty portion of it, he says, envelops their body on the outside, while the solid portion *mounts through the veins to the brain*. And this is how horns, being moistened with plentiful juices, come to sprout ...'. Transl. Scholfield). Another obvious parallel to Democritus' account on horns is offered by ch. 19–20 of *De natura pueri*, where the growth of nails and hair is described, recalling Empedocles' account of nails and, before Democritus, perhaps paralleled in Anaxagoras and Diogenes of Apollonia.

⁴⁹ See A. Evans, *JHS* 21, 1901, 107, 135ff.; M. Nilsson, *The Minoan-Mycen. Religion*, 154; Onians (1951) 237 = 286 ital. ed.

12. *Democritus' contribution to zoology, on balance*

We can now attempt a provisional balance, as well as an answer to the question concerning Democritus' contribution to zoology at its early stage. Aristotle was right: his interest in Democritus does not concern individual theories about animals, though these are mentioned, but the different theoretical colouring of his investigations. Aristotle, in the first book of *De partibus* (*Part. an.* 642a24 = A 36, cf. 640b30), observes that Democritus' real contribution must be sought in his remarkable interpretative effort of natural phenomena, of *physis*, since he was the first to realize the importance of defining the essence of things, of going beyond a purely phenomenological survey of data. Aristotle's text is explicit: αἴτιον δὲ τοῦ μὴ ἐλθεῖν τοὺς προγενεστέρους ἐπὶ τὸν τρόπον τοῦτον ὅτι τὸ τί ἦν εἶναι καὶ τὸ ὁρίσασθαι τὴν οὐσίαν οὐκ ἦν, ἀλλ' ἦψατο μὲν Δημόκριτος πρῶτος, ὥς οὐκ ἀναγκαῖον δὲ τῇ φυσικῇ θεωρίᾳ, ἀλλ' ἐκφερόμενος ὑπ' αὐτοῦ τοῦ πράγματος ('The reason for which our forerunners did not reach this kind of explanation is that they did not know the essence, that is, could not define the substance. Democritus was the first to touch upon it, not because it was necessary to natural science, but being driven by things themselves').⁵⁰

Aristotle links this wider perspective of Democritus' research to the latter's atomistic view. The section on Democritus in the fourth chapter of *De respiratione* clearly states that the issue of animal respiration is handled by Democritus in line with his idea of body and soul as atomic compounds; inhalation of air, by means of which elementary particles are introduced into the body from outside, is needed to redress the exhalation of soul atoms from the body (471b30ff.). In the same way, i.e. in connection with his atomistic outlook Democritus regarded seed and its distribution within man's genital apparatus in such a way that the dominance of one kind of 'seminal atom' ('Samenatome' according to Althoff),⁵¹ ὁποτέρου ἂν κρατήσῃ τὸ σπέρμα τὸ ἀπὸ τοῦ μορίου ἐλθόν (*Gen. an.* 764a6 = A 143), would determine the sex of the baby; thus the atomistic view is opposed to Empedocles', also quoted by Aristotle, in that the heat of the uterus is decisive.⁵² Significant in this respect is a passage from Philoponus' commentary on Aristotle's *De anima* (Philopon. in Aristot. *De an.* XV 67.30: the passage commented on is *De an.*

⁵⁰ On this Aristotelian passage, see also Jaulin in this volume, p. 263.

⁵¹ Althoff (1999) 90.

⁵² On these Aristotelian passages see Althoff (1999) 78ff., 90ff.

A 2, 404a1 πανσπερμίαν στοιχεῖα λέγει τῆς ὅλης φύσεως, scil. Leuc. and Democr.): πανσπερμίαν φησὶ τὸ πλῆθος τῶν σχημάτων· ὥσπερ γὰρ ἐν τῇ πανσπερμίᾳ ἔστιν ἐν τῷ σωρῷ καὶ σίτος καὶ κριθή καὶ τὰ ἄλλα σπέρματα, οὕτω καὶ ἐν τοῖς ἀτόμοις πανσπερμίαν εἶναι τῶν σχημάτων. ταύτης δὲ τῆς δόξης φησὶν εἶναι καὶ Λεύκιππον· ἑταῖρος γὰρ ἦν Δημοκρίτου ('he [scil. Democritus] calls *panspermia* the figures as a whole. As indeed in the *panspermia* of a pile of corn there are wheat and barley and other seeds, so also among the atoms there is a *panspermia* of figures. He says that this is also Leucippus' opinion, for he was a fellow of Democritus').

As we have seen, with the fruitful extension to biology of concepts related to his atomistic view of matter, starting with the concept of atom, Democritus could establish a minimum morphological unit which was essential to his physicism. To this he added an aetiological angle, as Aelian remarks (VI 60 = A 150a), who reproaches Democritus and his colleagues for having looked for causes without any suitable basis (this was inconsistent with Aristotle's critique of the atomists—that they had given up any deserved causal investigation—but he was speaking more generally and not with regard to individual events). But such an angle⁵³ must be looked for not only the way Aelian does, in the explanation of individual phenomena, nor is it very evident indeed in the few Democritean remains of zoological interest. An 'aetiology', in this sense, is also found in the writings attributed to Hippocrates, or, perhaps in a simpler form, in Herodotus or Hecataeus (cf. *FGrH* I F 302a) or Ctesias (cf. *FGrH* 688 F 46a). Though with regard to Democritus it is proper to speak of various levels of αἰτιολογία,⁵⁴ and to abandon a reductionist logic tracing everything back to atoms and void, nonetheless, in the case of zoology this perspective should be appraised as a more general framework, as an overall method of interpreting reality, according to the criterion οὐδὲν μάτην, ἀλλὰ πάντα ἐκ λόγου τε καὶ ὑπ'ἀνάγκης.

In Democritus, a more developed methodical awareness is added to an already established observational heritage, which is seen from a definite angle, viz. the atomistic one. The novelty of his contribution lies in the attempt to locate the zoological level within his broader view, so as to make an organic unity out of his investigations. Already established notions, traditional knowledge, new discoveries or hypotheses—

⁵³ Recently investigated by Morel (1996), see also (2000).

⁵⁴ Morel (1996) 28f.

in themselves rarely decisive—acquire a new meaning in that they are adapted to the atomistic theory. A visible sign of this is in the persistence of a peculiar linguistic use, even in scarce or not always linguistically reliable sources. For example, the occurrence of such terms as ἐκθλίβειν (A 153, Aelian) referring to horns; the whole description of this phenomenon in terms of an outcropping of substances thanks to the fine and porous (ἄρραιόν) character of the bony base; the συμμείνειν, usually typical of atoms, referring to the embryo in A 152 (Aelian), as well as hot/cold alternation (referring to atoms in A 49, Galen, as θερμομαίνεσθαι—ψύχεσθαι), or ἀντίτυπος, which is said of atoms in A 66 (Ps.-Plutarch), and of the bovid's cervical bone in A 155 (Aelian). We must proceed with due caution, as all the evidence is indirect and the terms also occur in other authors. Their combined presence in Democritus suggests, in any case, a not insignificant arrangement.

The direct association of the concept of the atom with that of seed, and the use of embryological analogies to explain cosmological phenomena, give precise hints concerning the reception of Democritus' doctrine in antiquity. The most revealing example is perhaps to be found in the first book of Lucretius' *De rerum natura*. It can be said that Lucretius, following Epicurus and atomism, recognizes no other meaning of the terms and concepts of biology than that of a more adequate description and understanding of the origin and 'physiological' processes of the universe. His work opens, right from the first lines after the proemial Hymn to Venus, with a precise parallel between the elementary cosmic particles and the seeds of animal and human generation, which is described by means of terms and phenomena typical of biology, concepts like the one of *genitalia corpora* and *semina rerum* (I 58f.), or the *genitali / concilio* of lines 182f., and the evocative sequence *creet, auctet alatque* of I 56. Lucretius wants to demonstrate not only that nothing is generated from nothing, but also that things can only be produced by particular seeds. The reference to the technical terms of biology is never abandoned, and occurs also in Cicero (*nat. deor.* II 81,14), where the *semen* is described as something such *ut id, quamquam sit perexiguum, tamen, si incidit in concipientem comprehendentemque naturam nantumque sit materiam qua ali augerique possit, ita fingat et efficiat in suo quidque genere, partim ut tantum modo per stirpes alantur suas, partim ut moveri etiam et sentire et appetere possint et ex sese similia sui gignere*.⁵⁵ This kind of argument is trans-

⁵⁵ Cf. Schrijvers (1978).

ferred by Lucretius to elementary particles in general, after his having identified them with the seed.

Lloyd remarked (1966, 245 ff.) that Anaxagoras' theory of σπέρματα acted as an important precedent in the deliberate reliance on a biological model in order to develop a general physical theory, and that a concept such as that of πανσπερμία had not only a technical value to express the pangenetic view, but also the purpose of describing the mixture of elementary particles: 'In spite of the problems of interpretation which Anaxagoras' theory presents, the doctrine of seeds seems to be an important instance of the deliberate application and adaptation of a biological model to a general physical theory. Like Anaxagoras, and conceivably under his direct influence, the Atomists seem to have used an image of seeds, or rather of a 'seed-mixture', in connection with the primary substance, the atoms themselves' (p. 247). Not incidentally, in Epicurus the word σπέρμα occurs as a technical, atomistic term in three cases, with no hint of its biological implications. Lucretius' entire first book attests to the analogy between biological phenomena and cosmology: this evidently was the most remarkable contribution of atomism according to the ancients.

I regard as quite to the point, as well as in accordance with Democritus' case, what has been observed about the relationship between natural science and natural philosophy (or 'physiology') in the times before Aristotle:⁵⁶ 'Wir wissen, daß in voraristotelischer Zeit die Naturwissenschaft im allgemeinen biologische, genauer gesagt, zoologische Beobachtungen *nur dann zur Kenntnis nahm, wenn sie für naturphilosophische Theorie von Belang waren*. Zoologische Beobachtungen als solche wurden *nur in der die empirischen Bedürfnisse berücksichtigenden Literatur ausgewertet* [i.e., technical and, especially, medical literature], während sie für die in dieser Zeit betriebene Naturwissenschaft von sekundärer Bedeutung blieben' (italics are mine). Democritus is not a zoologist, nor do his observations in themselves, as far as we can judge, offer a very original contribution. In this field, his role appears to be philosophical rather than scientific; he contributes to it with a positive drive, more than with a specialist's technical engagement.

⁵⁶ Harig and Kollesch (1974) 28.

DEMOCRITUS' *MOUSIKÁ*

ALDO BRANCACCI

1.1. *Catalogue of works and μουσικά*

The catalogue of Democritus' writings, compiled by Thrasyllus of Alexandria, an astrologer and scholar living during the reign of Tiberius, also credited with the edition of Plato's works in tetralogies, is preserved in Diogenes Laertius' *Life of Democritus*.¹ The sections of the edition are in the following order: ἠθικά; φυσικά; μαθηματικά; μουσικά; τεχνικά. The ἀσύντακτα are placed between φυσικά and μαθηματικά. This catalogue was studied by Wellmann, who concluded that it was not trustworthy for three reasons: it only recognised one *corpus Democriteum*, thus inserting the two works by Leucippus among those by Democritus; it included the nine dubious works classified separately; among the tetralogies it included Περί τῶν ἐν Ἄδου, which is arguably the work of Bolus of Mende, a follower of Democritus.² But inclusion of ἀμφισβητούμενα was quite normal in catalogues of ancient writings³ (see, for

¹ Cf. Diog. Laert. IX 46–49 (= 68 A 33 DK). On Thrasyllus' catalogue of Democritus see Mansfeld (1994) 97–105. On Thrasyllus cf. Vetter (1936) 581–584; Tarrant (1983) 85–89.

² Cf. Wellmann (1921) 5–8. Wellmann's arguments are summarized by Alfieri (1936) 180 n. 461, who was convinced by them and added others which seem no more compelling. Wilamowitz (1931) 304 n. 1; Schmid-Stählin (1948) 248 n. 7; Guthrie (1965) 436–438 argued for the authenticity of Περί τῶν ἐν Ἄδου. On the tradition of Democritus' writings cf. Schmid-Stählin (1948) 243–253 (especially the works on ethics); on the catalogue see Leszl, above.

³ Even granting, for the sake of argument, that the ἀσύντακτα were dubious, or spurious works, as Wellmann thought. I believe instead, with Mansfeld (1994) 101, that ἀσύντακτα was the label attributed to works on natural philosophy which had found no place in the system of tetralogies adopted by Thrasyllus, and that for this reason had been put aside. Cf. Mansfeld (1987) 585: 'die nicht in eine Viererordnung einbezogenen Schriften [naturphilosophischen Inhalts]'. It should be remembered that τάσσω also has the technical meaning 'arranging', in a specific order, the various parts making up the edition of a work (or book): cf., for example, the expression οἱ τάρττοντες in Synes. *Dio* pp. 239,17–240,2 Terzaghi, and my comment in A. Brancacci, *Rhetorike philosophousa. Dione Crisostomo nella cultura antica e bizantina*, Napoli 1985, 191–192. On the term τάξις, used by Albinus (*prol.* 4 p. 149, 5 sgg. Hermann), referring to the order of Plato's

example, the tenth volume of the catalogue of the writings of Antisthenes in Diog. Laert. VI 18),⁴ and the presence of a spurious title is not enough to discredit the catalogue, as comparison with the Platonic one shows. Thus Alfieri's conclusion that the Democritus catalogue 'is no guarantee for scholars'⁵ is excessive and misleading.

The μουσικά section consists of the following group of writings:

[1] His books were arranged in a catalogue by Thrasyllus and, like those of Plato, set out in tetralogies. [...] The Books on Music are as follows: 1. On rhythms and harmony; 2. On poetry; 3. On the beauty of poetic expressions; 4. On euphonic and disphonic letters; 5. On Homer or the correct choice of words and on obscure terms; 6. On song; 7. On words; 8. Onomastic. And these are the Books on Music.⁶

In Greek the word μουσική has a more limited sense, meaning the art of sounds, and a wider one, meaning not only music as it is normally understood, but also poetry, even extending to dance, i.e. the means of communication of a culture, which, especially in the archaic period, transmitted its products orally, in public.⁷ As the term μουσική basically designated, in this wider sense, music and poetry, thus μου-

Dialogues in the Tetralogies, cf. Mansfeld (1994) 71. The position of the ἀσύντακτα in the catalogue, shows, in my view, that Thrasyllus considered them authentic. He placed them between the ἡθικά and φυσικά, i.e. within (actually, right in the middle of) the tetralogical system. The fact that there were nine of them (or rather eleven, if we include the three books of Αἰτίαι περὶ ζώων) evidently did not allow them to be made into two or three tetralogies. Thrasyllus, at the end of the catalogue, after the tetralogies, mentions the nine writings ἐκ τῶν ὑπομνημάτων, i.e. writings that drew upon the *Notes* and after two other groups of writings attributed to Democritus: a) writings compiled from his works, b) writings unanimously considered spurious. On these cf. Schmid-Stählin (1943) 246. In short, Thrasyllus presented the five tetralogies, with the ἀσύντακτα in their midst, as γνήσια, and all that followed as ἀμφισβητούμενα and νόθα. This is coherent with the fact that, in ancient book catalogues, ἀμφισβητούμενα (and even more so, νόθα) were placed at the end of the catalogue.

⁴ They are placed at the end, after the last section of γνήσια (which are ὁμηρικά in Antisthenes' catalogue). On Antisthenes' catalogue cf. A. Patzer, *Antisthenes der Sokratiker. Das literarische Werk und die Philosophie, dargestellt am Katalog der Schriften*, Heidelberg 1970, 107–163; A. Brancacci, *Antisthène. Le discours propre*, Paris 2005, 17–39.

⁵ Cf. Alfieri (1936) 72 n. 113. Subsequently Alfieri toned down his opinion somewhat: see Alfieri (1953) 107.

⁶ Diog. Laert. IX 45–48 (= 68 A 33 DK): τὰ δὲ βιβλία αὐτοῦ καὶ Θράσυλλος ἀναγέγραφε κατὰ τάξιν οὕτως ὥσπερ καὶ τὰ Πλάτωνος κατὰ τετραλογίαν. [...] μουσικά δὲ τάδε · Περὶ ῥυθμῶν καὶ ἁρμονίας, Περὶ ποιήσεως, Περὶ καλλοσύνης ἐπέων, Περὶ εὐφώνων καὶ δυσφώνων γραμμάτων, Περὶ Ὁμήρου ἢ ὀρθοεπειῆς καὶ γλωσσέων, Περὶ αἰοιδῆς, Περὶ δημάτων, Ὀνομαστικόν. τοσαῦτα καὶ τὰ μουσικά. Most of the translations of these titles in Andolfo (1999) are far fetched and incorrect.

⁷ Cf. Gentili (1984) 31.

οικία was to designate the works devoted to the study and criticism of music and poetry, and the elements included in each of them: in the case of poetry, the study of poetic theory (but also language). Frank translated μουσικά by 'Musik', i.e. works on music,⁸ evidently following the ancient, more limited, meaning of the word, while Alfieri, with no justification, suggested 'Libri filologici', i.e. philological books.⁹ Lanata preferred modernisation, translating 'Opere di critica musicale e letteraria', i.e. music and literary criticism.¹⁰ Actually the word βιβλία is to be understood, and μουσικά, being an adjective, makes the translation 'Libri musici' preferable in Italian (and in Latin).¹¹ The large number of writings on μουσική and the outstanding variety of themes dealt with set Democritus apart in the 5th–4th century literary and musico-logical tradition. There were very strong ties with the previous poetic tradition made clear especially by the titles and confirmed by surviving fragments. Besides, Democritus' philosophical interests linked his reflections on music and poetry, on the one hand, to the Pythagorean tradition, certain motives of which he developed, and, on the other, to the Sophistic tradition, where there was more emphasis on questions of aesthetics and literary criticism. The μουσικά as a whole are evidence that Democritus was the first to attempt systematic autonomous treatment of problems of aesthetics and literary and musical criticism.¹²

When observing the structure and arrangement in the μουσικά section, it can be noted that the division of music on which Democritus' work was based was the ancient, traditional one into three parts: λόγος, ἁρμονία, ὄργανός. This division, which was acknowledged by Plato and often recalled by him in his works as being commonly accepted,¹³ was probably first formulated by Lasus of Hermione.¹⁴ The general musico-

⁸ Cf. Frank (1923) 27. And, more recently, cf. Taylor (1999) 68 ('Music').

⁹ Alfieri (1936) 207 n. 523. This expression could approach the meaning of γραμματικά in ancient book catalogues, used, for example, in Diog. Laert. V 87 for a section of the catalogue of the writings of Heraclides Ponticus. It should be noted that here the γραμματικά section was clearly distinguished from the μουσικά section.

¹⁰ Lanata (1963) 252. Cf. Jürss-Müller-Schmidt (1973) 127 ('Schriften über die musischen Künste').

¹¹ Gigante's translation ('scritti musicali') is also possible: cf. Gigante (1983) 372. See also Leszl, above pp. 38–40.

¹² Cf. Plebe (1959) 21. In Stella's view (1942) 37, Democritus' literary and musical criticism works were probably better known to his contemporaries than those on atomism.

¹³ See Plat. *Gorg.* 502 C; *Resp.* III 398 D; *Leg.* II 656 C; 669 B; VII 800 D.

¹⁴ Cf. Privitera (1965) 38–40.

logical work arranged by its ancient editor as an opening treatise was *Περὶ ῥυθμῶν καὶ ἁρμονίας*. The most complex theoretical writings will have been *Περὶ ποιήσεως* on poetry and poetic theory and *Περὶ ᾠοδῆς* on music and its relationship with poetry in song. All the other titles can easily be seen as centring on these two theoretical and thematic nuclei, which they further developed and made more explicit. *Περὶ καλλοσύνης ἐπέων* and *Περὶ εὐφώνων καὶ δυσφώνων γραμμάτων* dealt with the musical qualities of words and letters, and are a vivid expression of the phase in Greek poetics in which the relationship between music and poetry was not only indissoluble, but entirely well balanced, without domination of either element, both being also refracted and recomposed in the word sound texture in verse. *Περὶ Ὀμήρου ἢ ὁρθοεπειῆς καὶ γλωσσέων*, on the other hand, belonged to the field of literary criticism, while *Περὶ ῥημάτων* and *Ὀνομαστικόν* belonged to the linguistic and lexicographical ones, respectively:¹⁵ and perhaps the first of these last two writings could have been the link between Democritus' linguistic teachings and his more theoretical reflection on language.¹⁶

In the period in which Democritus was writing authors of prose works began to give them titles, on a reasonably regular basis. In the case of a philosopher of Democritus' importance exact determination and conceptualisation of different fields of investigation will have further facilitated, or rather required, the adoption of precise titles by the author. The *μουσικά* section bears visible signs of the fact that the titles transmitted are, at least generally, and considering Thrasyllus' role as reporter, original. The Ionic form of the *Περὶ ποιήσεως* immediately reveals the authenticity of the title. In the title *Περὶ ῥυθμῶν καὶ ἁρμονίας* the Ionic form *ῥυθμός*, which is found elsewhere in Democritus,¹⁷ is

¹⁵ The main codices of Diogenes Laertius disagree over this title: BF have *Ὀνομαστικῶν*, P has *Ὀνομαστικόν*. Both Long (1964) 1 and Marcovich (1999) 665 edit *Ὀνομαστικῶν*. The title in the genitive case presupposes the fall of the indication of the number of books (e.g. α' β' : cf. *Περὶ ἀλόγων γραμμῶν καὶ ναστῶν α' β'* of the *μαθηματικά*): Diels *ad loc.* ('Buchzahl fehlt'). A similar variation holds true for a mathematical piece: BPD give *Γεωμετρικῶν*, while F gives *Γεωμετρικόν*. It should be noted, however, that *Γεωργικόν* (corrected to *Γεωργικά* by Diels) and *Διατητικόν* appear as subtitles of *Περὶ γεωργίας* and *Περὶ διαίτης* respectively in the *τεχνικά*, and that *Τακτικόν καὶ Ὀπλομαχικόν* is the last title in the *τεχνικά* section.

¹⁶ On this see Brancacci (1986) 9–28.

¹⁷ See especially Aristot. *Met.* A 4. 985b4 (= 67 A 6 DK) with the well known distinction between *ῥυθμός*, compared by Aristotle to 'form' (*σχῆμα*), *διατήγη* and *τροπή*, and Id. *De anima*, A 2. 404a1 (= 67 A 28 DK), where *ῥυθμούς* means the 'configurations' of atoms. Cf Simplicius *Phys.* 28.15 (= 68 A 38 DK). Elsewhere we have *ῥυθμός* in place of *ῥυθμός*: cf. Herm. *Hirrisio*, 13 (= 68 A 44 DK).

not present, but this should not lead one to correct the title,¹⁸ because ὅσμος and ὅσθμος do not have the same meaning in Democritus. It is possible that ὅσθμος could refer back to the influence of the musical terminology becoming popular in Athens,¹⁹ where Democritus himself stated that he had stayed.²⁰ It should also be noted that ὅσμος did not come to the fore in music theory, keeping its overriding meaning of 'form' between the 5th and 4th centuries, both in Democritus and the *corpus Hippocraticum*,²¹ and in other authors. Symptomatically, the form ὅσμος was used by Democritus in the *Περὶ τῶν διαφερόντων ὅσμων* included in the *φυσικά* of the Laertian catalogue.²² In other cases it is the peculiarity of the titles that is a guarantee of their authenticity, a case in point being that of *Περὶ εὐφώνων καὶ δυσφώνων γραμμάτων*. A partially analogous case is that of *Περὶ καλλοσύνης ἐπέων*, whose authenticity is, in any case, assured by fr. 21 DK. Again, the subtitle of the *Περὶ Ὁμήρου ἢ Ὁρθοεπείης καὶ γλωσσέων*, if it is not original (not necessarily as a subtitle), had certainly been added by someone who had read the treatise and was well acquainted with it, as shown by the technical terms ὀρθοεπείη and the Ionic form γλῶσσα.

1.2. *Preliminary remarks*

In this chapter I shall only deal with Democritus' conception of music and poetry, leaving aside the texts concerning the exegesis of Homer, which would require a separate study.²³ Neither shall I examine Democritus' reflections on language, which I have already dealt with elsewhere.²⁴ When reconstructing these conceptions, I shall only consider the fragments and references which are genuine. I shall thus set aside both texts in which Democritus is not explicitly mentioned and are

¹⁸ As Fronmüller (1901) 7 did.

¹⁹ Cf. Wolf (1955) 115.

²⁰ Cf. Diog. Laert. IX 36: ἦλθον γὰρ εἰς Ἀθήνας καὶ οὕτως με ἔγνωκεν (= 68 B 116 DK). In the same paragraph Diogenes Laertius quoted Demetrius of Magnesia as the source for Democritus' journey to Athens. This was denied, we do not know on what basis, by Demetrius of Phalerum, cf. Diog. Laert. IX 37 (= fr. 93 Wehrli).

²¹ Cf. Hippocr. *De arte* 62, 36 (4 p. 268, 1) L.; *Septim.* (sp.) 122 and 124 Gr.

²² Cf. Diog. Laert. IX 46 (= 68 A 33 DK).

²³ It is basically a question of Porphyry. *Quaest. Hom.* 1 274, 9 Schrader (= 68 B 22 DK); Schol. Hom. A *ad H* 390 (= 68 B 23 DK); Eustath. *ad o* 376 p. 1784 (= 68 B 24 DK); Id. *ad μ* 62 p. 1713 (= 68 B 25 DK).

²⁴ Cf. Brancacci (1986).

only thought to refer to him, and those where the name of Democritus appears but could nevertheless be spurious. All this material can only be profitably examined subsequently, i.e. after Democritus' conceptions of music and poetry have been reconstructed on the basis of texts certainly by him or referring to him.

2. *Writings on Music*

There were basically three treatises containing teachings considered by classical theory to pertain to music: 1. On rhythms and harmony; 2. On euphonic and disphonic letters; 3. On song.

On rhythms and harmony (ΠΕΡΙ ΡΥΘΜΩΝ ΚΑΙ ΑΡΜΟΝΙΑΣ)

Zeller (1892) 914–915 n. 60, pointed out that, for Democritus, sound is a current of atoms, emitted by the resounding body, which starts the air moving with which it comes into contact. Similar atoms group together in this current causing the sensation of hearing. In *Περὶ ῥυθμῶν καὶ ἀρμονίας*, his intention was to explain the quantitative relations and various musical qualities of sounds. He will have explained that a sound is all the purer the more homogeneous are the atoms making it up, and all the higher the smaller the atoms in whose stream it originates. Frank attempted to reconstruct Democritus' teaching on music and concerning the concept of ἀρμονία and the analysis of the human voice and its elements, for the latter relying on Adrastus, a Peripatetic quoted by Theon. Frank attempted to distinguish Democritus' concept of ἀρμονία from that of Pythagoras, attributing to Democritus what Plato wrote about χρηστοί musicians in *Resp.* VII 531 B, where the latter were contrasted with Pythagoreans.²⁵ Nevertheless, Frank did not support Plato's presumed allusion to Democritus by sufficient evidence. Wolf remarked that ῥυθμός became a specialist musical term in the Sophistic period,²⁶ while we know that ῥυθμός and ἀρμονία were also studied by Hippias of Elis, who may have written a *Περὶ ῥυθμῶν καὶ ἀρμονιών*.²⁷ Naturally both Hippias and Democritus had been preceded by Damon:

²⁵ Cf. Frank (1932) 150ff. and 167ff.

²⁶ Cf. Wolf (1955) 115.

²⁷ Cf. Plat. *Hipp. ma.* 285 B (= 86 A 11 DK). The *Περὶ ῥυθμῶν καὶ μέτρων* attributed to Philolaus is probably not authentic (cf. 44 B 22 DK).

cf. Aristoph. *Nub.* 636–654; Plat. *Resp.* III 400 A (= 37 B 9 DK).²⁸ It should be recalled that ῥυθμός played a fundamental role in Democritus' atomism,²⁹ designating the atomic form in a dynamic rather than static sense, i.e. as the mobile image of a trajectory, and that ἁρμονία also had a place in Democritus' philosophy, as can be seen in Stob. II 7,3 (= 68 A 167 DK), where the word appears together with εὐεστό, συμμετρία and ἀταραξία designating the state of happiness and tranquillity of mind more commonly called εὐθυμία by Democritus. Placement of Περὶ ῥυθμῶν καὶ ἁρμονίης within the μουσικά leaves no doubt that this piece of writing had a musicological content, but it cannot be excluded, and is actually probable, that the notions put forward included echoes and links from Democritus' physical conceptions.

The only information referable, albeit hypothetically, to this treatise is:

[2] The first inventor of the dactylic hexameter, according to Critias, was Orpheus, and according to Democritus, Musaeus.³⁰

Alfieri argued that this information was dependent on Περὶ ποιήσεως or Περὶ ἀοιδῆς,³¹ but Lanata rightly quoted Aristot. *Poët.* 1448b21: τὰ γὰρ μέτρα ὅτι μόρια τῶν ῥυθμῶν ἐστι φανερόν.³² Aristot. *Rhet.* III 1498b32–33, where, distinguishing between the various types of rhythm, he stated that the heroic rhythm needs harmony (ἁρμονίας δεόμενος), should be added to the previous passage. With reference to the passage quoted above, it should be noted that, when attributing priority in the invention of the hexameter to Musaeus, Democritus intended to bestow the greatest antiquity on religious poetry.³³ The historical value of these statements should not be underestimated, recalling, on the one hand, that both Orpheus and Musaeus were generally considered more ancient than Homer and, on the other, Herodotus' original view: 'I believe that Hesiod and Homer lived four hundred years before me, and no more [...]. And the poets who are said to have lived before

²⁸ For the term ῥυθμός Herodot. V 58, 6 should be remembered: for ῥυθμός see Plat. *Symp.* 187 B 7, C 5/6, D 1.

²⁹ On this see von Fritz (1939) 25–26; Alfieri (1953) 66–68; Wismann (1980) 68–73.

³⁰ Mall. Theod. *De metr.* VI 589, 20 Keil (= 68 B 16 DK): *metrum dactylicum hexametrum inventum primum ab Orpheo Critias asserit, Democritus a Musaeo.*

³¹ Cf. Alfieri (1936) 207 n. 523.

³² Cf. Lanata (1963) 254. For Hippias see Plat. *Hipp. mi.* 368 C 7–D 4 (= 86 A 12 DK). Cf. also Plat. *Cratyl.* 424 B 10–C 3.

³³ Cf. Kleingünther (1933) 108.

these men, I believe lived at a later time'.³⁴ Chronological interest in Homer began early, dating back to Theagenes and keenly interested the Sophistic period.³⁵ For Theagenes of Rhegium cf. Tatian 31 p. 31, 16 Schw. (= 8,1 DK): *περὶ γὰρ τῆς Ὀμήρου ποιήσεως γένους τε αὐτοῦ καὶ χρόνου καθ' ὃν ἤκμασεν προηρεύνησαν πρεσβύτατοι μὲν Θεαγένης τε ὁ Ῥηγίνος κατὰ Καμβύσῃν γεγονὼς καὶ Στησίμβροτος ὁ Θάσιος κτλ.* ('the most ancient investigators of the poetry of Homer, of his kindred and age, were Theagenes of Rhegium, who lived at the time of Cambyses, Stesimbrotus of Thasos, etc.').³⁶

On euphonic and disphonic letters (ΠΕΡΙ ΕΥΦΩΝΩΝ ΚΑΙ ΔΥΣΦΩΝΩΝ ΓΡΑΜΜΑΤΩΝ)

To understand the meaning of these titles and writings it should be remembered that the study of the effectiveness of sounds within single words and lines was already active in archaic lyric poetry, which was characterised by a close relationship between poetry and music, and the basically oral channel of production, enjoyment and reception of poetry.³⁷ It is possible that reference was made in *Περὶ εὐφώνων καὶ δυσφώνων γραμμάτων* to Lasus of Hermione, author of *Περὶ μουσικῆς* and himself a poet, who (at the end of the 6th century) was the first to pose the problem of euphony of sound in the texture of verse in music, and had resolved it, radically and provocatively, by banishing the letter Sigma from poetical composition and composing one or more asigmatic odes, which were famous in antiquity.³⁸ Since, nevertheless,

³⁴ Herodot. *Hist.* II 53, 2–3: *Ἡσίοδον γὰρ καὶ Ὀμηρον ἡλικίην τετρακοσίοισι ἔτεσι δοκέω μὲν πρεσβυτέρους γενέσθαι καὶ οὐ πλέοσι [...]. οἱ δὲ πρότερον ποιηταὶ λεγόμενοι τούτων τῶν ἀνδρῶν γενέσθαι ὕστερον, ἔμοιγε δοκέειν, ἐγένοντο.*

³⁵ For genealogical and chronological interest in Homer see Pherecydes, 3 F 167 *FGrH*; Xenophanes, 21 B 13 DK; Hellanicus, 4 F 5 *FGrH*; Damastes of Sigeum, 5 F 11 *FGrH*; Gorgias, 82 B 25 DK. On the question cf. Marx (1925) 395–431. As correctly pointed out by Schadeewaldt (1944²) 55 and Flashar (1958) 226, this interest was rooted in the Homeric studies already carried out by the Homerids. Cf. Lasserre (1976) 113–142 on this.

³⁶ On Theagenes cf. Svenbro (1984) 101–121 also for further bibliography.

³⁷ Cf. Patillon (1988) 147 ff.; Rispoli (1995) 17–19.

³⁸ Cf. Athen. X 448 C (Lasus of Hermione test. 3 Privitera = fr. 3 (704) Page); Heracl. Pont. ap. Athen. X 448 D (= fr. 161 Wehrli = Lasus of Hermione, fr. 1 b Privitera = fr. 1 (702) Page). On the ode composed by Pindar excluding Sigma cf. Clearch. ap. Athen. 455 C (= fr. 88 Wehrli); cf. also Athen. X 448 D and XI 467 B. On asigmatism cf. also Athen. XI 467 A; Dionys. Halicarn. *De comp. verb.* XIV 80–81 pp. 54–55 Usener-Radermacher.

the sibilant, which the ancients disliked, owing to its savage, hissing sound, and which was little used, obviously could not be excluded from the Greek language, a new vocal technique, known and praised by Pindar, was introduced.³⁹ but the difficulty was of a more general nature, as Privitera correctly pointed out,⁴⁰ presupposing the problem of the relationship between music and the poetic text, on the one hand, and song, in which both are realised, on the other. The title of Democritus' piece showed that he contributed to the question with a specific, thorough treatment, whose aim was to be a clarification of the conditions of the euphony of poems, in setting up literary criticism where the musical values and those of the sound of the verbal texture of the verse were determining requirements and judgement criteria. In the sophistic sphere this interest was to be cultivated by Antiphon⁴¹ and Hippias, who, as Plato reported, devoted lengthy treatment to the δυνάμεις γραμμάτων καὶ συλλαβῶν.⁴² The first substantial surviving treatment of the qualities of the sound of single letters is, as is well known, to be found in Plato's *Cratylus*, where, as has already been noted, Socrates speaks giving his hearers to understand that he was moving over already dug up ground.⁴³ The following two pieces of information certainly depend on this treatise:

[3] The letter γάμμα was called γέμμα by the Ionians, and especially by Democritus, who also calls the μῦ μῶ.⁴⁴

[4] The names of letters are indeclinable [...] but were declined in Democritus: he said δέλτατος and θήτατος.⁴⁵

We are thus informed that Democritus dealt with, at least, the letters Delta, Theta, Gamma and Mu, but, as shown by the title, with γραμ-

³⁹ Cf. Pind. fr. 70 b Maehler, and on this fragment see von Wilamowitz-Moellendorf (1922) 342. As Sevieri (1999) 203 observes, Pindar contrasted the novelty of his own poetry with the monotonous, boring poetry of his predecessors, which was criticised when performed owing to the inappropriate pronunciation of the sibilant.

⁴⁰ Cf. Privitera (1965) 30.

⁴¹ Cf. Philod. *De poëm.* 1 (*PHerc.* 994) col. XXXVIII 3–23 p. 113 Sbordone (= 87 B 93 DK).

⁴² Cf. Plat. *Hipp. ma.* 285 C.

⁴³ Rispoli (1995) 17 n. 21. On possible connections between Cratylus and Democritus cf. Philippson (1929) 923–927 (to be taken, however, with some caution).

⁴⁴ Eustath. *ad Γ* 1 p. 370,15 (= 68 B 19 DK): τὸ γάμμα στοιχεῖον γέμμα φασί, Ἴωνες καὶ μάλιστα Δημόκριτος, ὃς καὶ τὸ μῦ μῶ λέγει.

⁴⁵ Schol. Dionys. Thrac. p. 184, 3 Hilg. (= 68 B 20 DK): τὰ ὀνόματα τῶν στοιχείων ἀκλιτὰ εἰσιν [...] παρὰ Δημοκρίτῳ δὲ κλίνονται · λέγει γὰρ δέλτατος καὶ θήτατος.

ματα in general, distinguishing between euphonic and disphonic letters, in accordance with their sound characteristics. This distinction was basic to the theory of euphony, which was to encounter variations and complications in antiquity (and it is worth recalling, in the context of the evaluation of poetry in connection with music, that it would again come to the fore in the Middle Ages with Dante's division of words into 'pexa' ('combed'), and 'yrsuta' ('hirsute').⁴⁶ The poetics of euphony sheds light on aesthetic taste moulded on an experience of and feeling for poetry the vehicle of which is song. And it cannot be excluded that some of Plato's linguistic remarks in the *Cratylus* (426 C – 427 D) about the mimetic-semantic power (δύναμις) of particular letters—Rho as an instrument of movement, Iota as a marker of subtlety, Phi, Psi and Sigma, and Zeta as fricatives marking all kinds of shaking, Delta and Tau as markers of linking and stasis respectively, and also remarks on Lambda, Gamma and Nu, as well as the description of Alpha and Eta as grandiloquent letters (μεγάλα γράμματα)—owed something to distinctions already established by Democritus.

On song (ΠΕΡΙ ΑΟΙΔΗΣ)

The loss of this treatise, whose content appears to have been connected once again with the line of enquiry begun by Lasus of Hermione in the *Περί μουσικῆς* attributed to him, is momentous for the knowledge of the relationship posited by Democritus between music and poetry in song. An idea of the presumed content of this work can be had from an extensive treatment in Plutarch:

[5] We are particularly ridiculous when we celebrate animals as models for our ability to learn. Democritus showed how we were disciples of animals in all our most important activities: of the spider in the art of

⁴⁶ Cf. Dante Alighieri, *De vulgari eloquentia*, II VII 3–7: *Solo etenim pexa yrsutaeque urbana tibi restare videbis, qua nobilissima sunt et membra vulgaris illustris. Et pexa vocamus illa que, trisyllaba vel vicinissima trisyllabitati, sine aspiratione, sine accentu acuto vel circumflexo, sine z vel x duplicibus, sine duarum liquidarum geminatione vel positione immediate post mutam, dolata quasi, loquentem cum quadam suavitate relinquunt [...]. Yrsuta quoque dicimus omnia preter hec que vel necessaria vel ornativa videntur vulgaris illustris. Et necessaria quidem appellamus qua campsare non possumus, ut quedam monosyllaba, ut si, no, me, te, se, a, e, i, o u', interiectiones et alia multa. Ornativa vero dicimus omnia polisyllaba que, mixta cum pexis, pulcrum faciunt armoniam compaginis, quamvis asperitatem habeant aspirationis et accentus et duplicium et liquidarum et prolixitatis.*

weaving and darning, of the swallow in building houses, of songbirds, the swan and nightingale, in song, by means of imitation.⁴⁷

The dependence of this passage on *Περὶ ἀοιδῆς* is a mere conjecture, and Reinhardt, for example, argued that the fragment belonged to the *Μικρὸς διάζοσμος*.⁴⁸ One may believe, however, that the mimetic character of song and music stated there was also one of the themes in *Περὶ ἀοιδῆς*. The application of the concept of *μίμησις* to music is historically very noteworthy and shows the importance of Democritus' (and the Sophists') aesthetic research before the great work of Plato and Aristotle. The passage, as pointed out by Sörbom,⁴⁹ is paradigmatic of the strong aetiological taste peculiar to the Greeks. According to Democritus, when man first started his different arts and crafts he did not create them out of nothing. He looked at the work of different animals, admired their ways of tackling different problems, decided to do such things himself, and therefore he adopted ways of performing them similar to those employed by the animals. Else and Bailey argued that *κατὰ μίμῃν* only referred to this last case, i.e. learning to sing, and not to other activities.⁵⁰ Nevertheless, the idea expressed in the fragment belongs to Democritus' *Kulturgeschichte*, and in this sense is linked to a passage deriving from the *Small Cosmology*, which will be examined shortly. The means by which humans reached the invention of *τέχνη* was imitation, through observation, of animals, learning and

⁴⁷ Plutarch. *De sollert. anim.* 20 p. 974 A (= 68 B 154 DK): γελοῖοι δ' ἴσως ἐσμέν ἐπὶ τῷ μανθάνειν τὰ ζῷα σεμνύνοντες, ὃν ὁ Δημόκριτος ἀποφαίναται μαθητὰς ἐν τοῖς μεγίστοις γεγονότας ἡμῶς· ἀράχνης ἐν ὑφαντικῇ, χελιδόνος ἐν οἰκοδομίᾳ, καὶ τῶν λιγυρῶν, κύκνου καὶ ἀηδόνης, ἐν ᾧδῇ κατὰ μίμῃν. For translation of the passage, I take into account those by Alfieri (1936) and Mansfeld (1987) 669: *Vielleicht aber ist es lächerlich, wenn wir beteuern, daß die Tiere lernen können—[die Tiere,] von denen Demokrit sagt, daß wir 'in den wichtigsten Dingen ihre Schüler geworden sind: der Spinne im Weben und Stopfen, der Schwalbe im Hausbau, und der Singvögel, [d.h.] des Schwans und der Nachtigall, im Gesang—auf dem Wege der Nachahmung'.*

⁴⁸ Cf. Reinhardt (1912) 511.

⁴⁹ Cf. Sörbom (1966) 70. I do not agree with C.W. Veloso, *Aristoteles Mimético*, São Paulo 2004, 813–814, who believes that, in the expression *κατὰ μίμῃν*, *μίμησις* means 'simulation' ('simulação').

⁵⁰ Cf. Else (1958) 83 n. 45; Bailey (1947) III 1540. Diels had already translated the fragment in this sense: *'Die Menschen sind in den wichtigsten Dingen Schüler der Tiere geworden: der Spinne in Weben und Stopfen, der Schwalbe im Hausbau und der Singvögel, der Schwans und der Nachtigall, im Gesang und zwar auf dem Wege der Nachahmung'* (DK, II 173).

mimesis advancing together in the acquisition of arts and techniques.⁵¹ As a Homeric scholar, Democritus will probably have had in mind the line *Od.* τ 521 on the nightingale, the songbird *par excellence*, which also attracted the attention of Antisthenes.⁵² It is more difficult to say whether he also knew fr. 92 Diehl (= 39 *PMG*) of Alcman, on which see Marzullo,⁵³ which is worth quoting: ἔπη γε δὲ (codd.: φέπη τάδε *PMG*) καὶ μέλος Ἀλκμάν / εὔρε γεγλωσσαμέναν / κακκαβίδων ὅπα συνθέμενος ('Alcman found words and melody gathering the articulated song of partridges'). For Alcman see also fr. 93 Diehl (= 40 *PMG*): οἶδα δ' ὀρνίχων νόμῳ / πάντων ('I know the melodies of all birds'). Chamaeleon the Peripatetic was also to state, quoting fr. 92 Diehl of Alcman, but extending reference to the 'ancients' (τοῖς ἀρχαίοις), which may also have included Democritus, that they had linked the discovery of music with the imitation (μίμησιν) of songbirds.⁵⁴

3. *Democritus' conception of Music*

To reconstruct the basics of Democritus' conception of music it is necessary to start from a passage which is thought to derive from the *Small Cosmology*:

[6] Once fire and the other useful things for life had been known, shortly afterwards crafts and all other beneficial means for life in society were discovered. Thus utility itself was, in general, the master of all things for man.⁵⁵

⁵¹ For the connections of B 154 DK with Hippocrates' *De victu* and the theme of imitation in the sphere of τέχνη cf. Koller (1954) 58–63.

⁵² Cf. Porphyry *schol. ad Od.* α 1 (= SSR V A 187), and on this fragment cf. Brancacci (1990) 51–56.

⁵³ Cf. Marzullo (1955) 73–94, now in Marzullo (2000) 49–70.

⁵⁴ Cf. Athen. 389 F (= fr. 24 Wehrli): διὸ καὶ Χαμμαλέων ὁ Ποντικὸς ἔφη τὴν εὔρεσιν τῆς μουσικῆς τοῖς ἀρχαίοις ἐπινοηθῆναι ἀπὸ τῶν ἐν ταῖς ἐρημίαις ὀρνίθων · ὧν κατὰ μίμησιν λαβεῖν σύστασιν τὴν μουσικὴν. οὐ πάντες δ' οἱ πέρδικες, φησί, κακκαβίζουσιν.

⁵⁵ Diodor. I 8, 8–9 (= 68 B 5 DK): γνωσθέντος δὲ τοῦ πυρὸς καὶ τῶν ἄλλων τῶν χρησίμων κατὰ μικρὸν καὶ τὰς τέχνας εὑρεθῆναι καὶ τὰλλα τὰ δυνάμενα τὸν κοινὸν βίον ὠφελεῖν. καθόλου γὰρ πάντων τὴν χρειαυ αὐτὴν διδάσκαλον γενέσθαι τοῖς ἀνθρώποις κτλ. The derivation of Diodorus' extract from Democritus was proposed by Reinhardt (1912), 511 who argued that Diodorus I 8 and Tzetzes *schol. ad Hesiod.* (PGM III 58 Gaisford) derived from Hecataeus of Abdera and through him from the *Small Cosmology*. Norden (1892) thought that Epicurus was the common source of Diodorus and Tzetzes. Reinhardt's hypothesis, challenged by Spoerri (1959), was developed by Cole (1967), who (by way of hypothesis) tried to identify Democritus as the common source of Diodorus I 8, Vitruvius II 1, Lucretius V, Seneca's *Ep.* 90 (from Posidonius) and Tzetzes.

The *Small Cosmology* outlined the formation of the world, the origin of living species and the history of human civilisation, whose progressive evolution was determined and studied on the basis of the action of the criteria of experience (πείρα) and utility (συμφέρον). The last stage, following on from the discovery of fire,⁵⁶ was the introduction of τέχναι. A reconstruction of the arguments can be attempted over the genesis of song by recalling another passage taken from the same text by Diodorus: 'and while before [men] made inarticulate, meaningless sounds, they gradually began to articulate words, and setting up amongst them conventional expressions to designate each object, they arrived at the creation of a way, known to them all, of expressing everything'.⁵⁷ Thus the presupposition of the genesis of language lay in διαθροῦν, i.e. in the ability to make articulate sounds. When this faculty was joined by careful listening to singing animals, as stated in the fragment quoted by Plutarch, and by the imitation (μίμησις) of their sounds, the conditions for constituting the τέχνη of song had been established.

At this point a well known fragment preserved by Philodemus can be introduced:

[7] Democritus, a man who was not only the most learned about nature of all the ancients but no less industrious than any other inquirer, states that music is more recent [than the other arts], and identifies its cause, saying that it did not correspond to a need, but was born when the superfluous already existed.⁵⁸

This fragment is important, especially because it is evidence of the application of Democritus' αἰτιολογία⁵⁹ to music. Moreover, this text completes the scheme of the discovery of the various τέχναι in the

Bertelli (1980) 527–532, though challenging the derivation of Diodorus' extract from Hecataeus, acknowledged the presence of motives from Democritus in an Epicurean evolutionary scheme. See also Guthrie (1965) 473–474.

⁵⁶ See the analogous motive in the account attributed by Plato to Protagoras in *Protag.* 322 a.

⁵⁷ Diod. I 8, 3 (= 68 B 5 DK): τῆς φωνῆς δ' ἁσήμεν καὶ συγκεχυμένης οὔσης ἐκ τοῦ κατ' ὀλίγον διαθροῦν τὰς λέξεις, καὶ πρὸς ἀλλήλους τιθέντας σύμβολα περὶ ἐκάστου τῶν ὑποκειμένων γνώριμον σφίσις αὐτοῖς ποιῆσαι τὴν περὶ ἀπάντων ἐρμηνείαν.

⁵⁸ Philod. *De musica* (= *PHerc* 1497 col. XXXVI 29–39) p. 108, 29 Kemke (= 68 B 144 DK): Δημόκριτος μὲν τοίνυν [...] μουσικὴν φησι νεωτέραν εἶναι καὶ τὴν αἰτίαν ἀποδίδωσι λέγων μὴ ἀποκρίναι τὰναγκαῖον, ἀλλὰ ἐκ τοῦ περιεῦντος ἤδη γενέσθαι. Delattre–Morel (1998) suggest the emendation ἀπ' ἐκείνου (in place of ἀποκρίν[αι]). Hammerstaedt (1998) emended τὰναγκαῖον to τὰναγκαῖον.

⁵⁹ On Democritus' *aitiologia* see Morel (1996) 25–30. Cf. also Lee (2005) 191–192.

sphere of Democritus' *Kulturgeschichte*. He expressed his point of view with the clarity of ideas one expects of him. The arts had an articulated, progressive genesis, and it was natural that, in a temporal scheme marked by criteria of necessity, by experience and utility, music, a technically elaborated form of expression and of ornate living, should arise in a final stage, when the basics of life were no longer of vital importance and prosperity had been attained. It should be recalled that Democritus' idea that music arose at an advanced stage in human development, when people had been freed of the bare necessities, was taken up by Aristotle.⁶⁰ Comparison between fr. B 154 DK, according to which humans acquired their manual abilities and more sophisticated ones, such as song, by means of imitation of animals and fr. B 144 DK, according to which music originated in plenty (ἐκ τοῦ περιεῦντος), shows that the progressive acquisition of skills and arts leaves some room for an element of 'spontaneous' development, but, as Steckel noted, this viewpoint is perfectly reconcilable with the determinism (understood correctly) of the atomist theory.⁶¹

The meaning of this conception was distorted by Lasserre who, with no textual basis, argued that Democritus had meant to diminish music, seeing it as mere *divertissement*. In his arbitrary, superficial conclusion he affirmed: 'cela revient à dire que la musique, comparée aux autres arts, est un art d'agrément. Elle n'a par conséquent la même valeur éducative etc.', and on this basis invented a dispute on the part of Democritus, who was alleged to be a supporter of a hedonist conception of music, in opposition to the ethical-pedagogical one of Damon.⁶²

⁶⁰ Aristot. *Met.* 981b17–20: 'and it is also logical that, after the discovery of several crafts and arts, the former for the necessities of life and the latter for well being, the discoverers of the latter were judged wiser than those of the former, the reason being that their knowledge was not applied to utility'.

⁶¹ Cf. Steckel (1970) 220: 'Alle Eigenschaften und Fähigkeiten sind als Folge seiner unbestimmten Vielzahl von Atombewegungen notwendig zufällig entstanden', referring back to Guthrie (1965) 417–419. Cf. also Windelband (1923⁴) 86 and n. 4. Cf. K. Joël, *Geschichte der antiken Philosophie*, Tübingen 1921, 609: 'Aber diese Notwendigkeit, auf die der Atomist alles zurückführt, ist nicht eine fremde Macht oder auch nur ein besonderes Prinzip über den Dingen, sondern ist ihnen immanent und läßt den Weltprozeß spontan, automatisch erfolgen—so vereinigen sich die ἀνάγκη und das αὐτόματον des Werdens in Aristoteles' Bericht. Die Welt bildet sich selbst aus *eigener* Notwendigkeit und wirkt sich aus ohne Hinzutritt irgend einer Kraft'.

⁶² Lasserre (1954) 87. See also Koller (1954) 146 and Webster (1939) 172. But in opposition, see already Brancacci (1988) in Brancacci *et al.* (1988) 74.

To contradict these statements by Lasserre, inappropriately followed by Lanata on this point,⁶³ a fragment of Democritus himself, placed by Diels in the ethical section, is sufficient. This is also important for shedding light on Democritus' conception of music and *paideia*:

[8] Children left alone in idleness, as is the custom among barbarians, will not learn reading and writing, music or gymnastics or a sense of honour, which is, more than anything else, the true foundation of virtue, because the sense of honour will arise through these disciplines.⁶⁴

Though this passage (for the translation of which I followed Alfieri, who translated the manuscript reading ἐξωτικῶς μὴ πονεῖν, which Diels put between *cruces*)⁶⁵ is important for clarifying Democritus' conception of music, it was not quoted by either Lasserre or Lanata. The fragment contradicts these scholars' hypotheses concerning a presumed hedonist evaluation of music in opposition to Damon on Democritus' part, allowing them to be overturned. Democritus actually included music, together with γράμματα μανθάνειν and gymnastics, among the activities contributing to the acquisition of αἰδώς and thus to the realisation of human virtue (ἀρετή), its intimate value lying in the ability to form the feeling of honour (αἰδώς).⁶⁶ Moreover, in conformity with the austere and partially strict character of his moral reflections, Democritus linked the practice of these three disciplines with the idea of effort or fatigue (πόνος), which played a leading role in his moral thought.⁶⁷ The γράμματα μανθάνειν—μουσική—ἀγωνίη triad, taken up as the basis of education, showed that Democritus was perfectly in line with the most classical values of Greek παιδεία, to the extent of significantly associating neglect of these disciplines with the idea of 'exotic' or barbarian customs. It should be noted that inclusion of reading and writing in basic education reveals the arrival of the new system of education (νέα παιδεία) in opposition to the ἀρχαία παιδεία referred to by Aristophanes in the *Clouds*, where the latter is solely based on music and gymnas-

⁶³ Cf. Lanata (1963) 267.

⁶⁴ Stob. II 31, 57 (= 68 B 179 DK): ἐξωτικῶς μὴ πονεῖν παῖδες ἀνέντες οὔτε γράμματα ἄν μάθοιεν οὔτε μουσικὴν οὔτε ἀγωνίην οὐδ' ὅπερ μάλιστα τὴν ἀρετὴν συνέχει, τὸ αἰδεῖσθαι· μάλα γάρ ἐκ τούτων φιλεῖ γίγνεσθαι ἡ αἰδώς. For the Greek text, cf. also Natorp (1893) 26: ζηλωτικῶς ὁμῇ πονεῖν κτλ., and Wachsmuth-Hense (1974³) 211.

⁶⁵ Cf. Diels-Kranz (1985) 181: 'Wenn man die Knaben nicht zum Arbeiten frei läßt usw.'.

⁶⁶ For αἰδώς in Protagoras cf. Plat. *Protag.* 322 C (= 80 C 1 DK).

⁶⁷ Cf. Stob. III 29, 63 (= 68 B 240 DK) and III 29, 64 (= 68 B 241 DK).

tics, the two disciplines proper to traditional, aristocratic education.⁶⁸ Democritus was thus in line with the new trends of sophistic education, presupposing the teaching of Damon.⁶⁹

4. *Writings on Poetry*

Even though Democritus' conception of μουσική, grounded in the interrelation of λόγος, ἁρμονία and ῥυθμός, implied a strong correspondence between poetry and music, which obviously cannot be as clearly distinguished as in modern aesthetics, the very titles of his μουσικά already show to what extent he was able to conceive of separate treatment for the two arts. Taking account of the fact that references to poetry will also have been included in the works devoted to music, the treatises to be considered as directly pertaining to poetry and poetic theory are: 1. On poetry; 2. On the beauty of poetic expressions; 3. On Homer, or the correct choice of words and obscure terms.

On poetry (ΠΕΡΙ ΠΟΙΗΣΙΟΣ)

The composition of a specific treatise on poetry appears to show how compact and advanced Democritus' reflections were in the aesthetic sphere. It is from this work, which appears to have been the earliest treatment of poetry in Greek philosophy that, either directly or through intermediaries, the information given by Cicero and Horace (= 68 B 17 DK) as well as a fragment preserved by Clement of Alexandria (= 68 B 18 DK) derived.

It is worth taking a preliminary look at this fragment, concentrating on the Greek text:

Clem. Al. *Strom.* VI 168: καὶ ὁ Δημόκριτος ὁμοίως ποιητῆς δὲ ἅσσα μὲν ἂν γράφῃ μετ' ἐνθουσιασμοῦ καὶ ἱεροῦ πνεύματος, καλὰ κάρτα ἐστίν.

⁶⁸ Cf. Aristoph. *Nub.* 961–983, especially 964–974, and see Dover (1970) XXIII–XXV.

⁶⁹ On the role of Damon, as an advisor to Pericles, in the organisation of the cultural scene and new educational system in Athens, cf. Brancacci (2005) 13–21. For Protagoras and Damon, see Brancacci (2001) 137–148. On Damon's musical doctrines see A. Barker (ed.), *Greek Musical Writings, I: The Musician and his Art*, Cambridge 1984, 168–169.

Mansfeld (2004) has recently argued that the text recorded by Clem. Al. *Strom.* VI 168 is not a literal quotation from Democritus, but a paraphrase of the text of Democritus partly quoted by Dio Chrysostom (i.e. fr. B 21 DK). The hypothesis is attractive and deserves due consideration: one cannot definitely assume, a priori, that Clement recorded Democritus' *ipsissima verba*. In my view the opening ποιητής is authentic—since Democritus, who was the author of a treatise Περί ποιήσεως (as well as of a treatise *On the beauty of poetic expressions* and of a work specifically devoted to Homer), is very likely to have referred to the poet in general—and the term ἐνθουσιασμός can hardly be due to Clement, being a *hapax* in his work and occurring only within this quotation from Democritus. The closing expression καλὰ κάτα, suspected by Mansfeld in that it appears to be 'jejune', could actually be a formula used by Clement to summarize a Democritean idea expressed in a more complex way; but it could also be itself Democritean, all the more so as one accepts the hypothesis that Democritus' text did not end with these words but went on with an antithesis, whose possibility is suggested by the ἄσσα μὲν ἂν γράφηι that can be read at the beginning of the quotation. For this hypothesis, and further observations on this fragment, see below, in the main text and footnotes.

On the beauty of poetic expressions (ΠΕΡΙ ΚΑΛΟΣΥΝΗΣ ΕΠΕΩΝ)

The piece entitled Περί καλλοσύνης ἐπέων will have had a more explicitly aesthetic character in respect of Περί εὐφώνων καὶ δυσφώνων γραμμάτων, with which it appears to be linked,⁷⁰ and the remarks on the sound and musical texture of words in verse in it but also in Περί ῥυθμῶν καὶ ἁρμονίας, will have been organically collected in it. The coherence of the investigation conducted in these three pieces should be appreciated: the term ἔπη is used for words, of which γράμματα are the ultimate constituents. Words and letters constituted the basis of rhythm in verse, to which the adoption of a particular musical harmony corresponded. The term ἔπος, which, by extension, from the primary meaning of 'word' meant the word accompanied by music, and thus 'verse' (cf. Hom. θ 91; Herodot. IV 29; Aristoph. *Ran.* 802), in the plural, designated 'epic verse', 'epic poetry' (cf. Pind. *Nem.* II 2; Herodot.

⁷⁰ Cf. Norden (1898): tr. it. Norden (1986) 68. According to Gudeman (1934) 10, these writings were (together with Περί ῥυθμῶν καὶ ἁρμονίας and Περί ποιήσεως) 'vermutlich Unterabteilungen eines größeren Werkes'.

II 117; Thucyd. I 3, 3), and, more generally, 'poetry'. Here, however, it meant words in verse, as Fronmüller noted,⁷¹ and, to keep the distinction in translation from the title of the other piece by Democritus, *Περὶ ῥημάτων* (On words), use of the phrase 'poetic expressions' proves useful.⁷² For Democritus' use of the term the fragment preserved by Dio Chrysost. *Orat.* XXXVI 1 (= 68 B 21 DK) should be recalled as well, illustrating the programme of *Περὶ καλλοσύνης ἐπέων*, though not depending on it directly.

It is probable, though it cannot be proved, that this treatise, as well as the treatise *On Euphonic and Disphonic Letters* also included linguistic or pre-grammatical interests, which precisely in the Sophistic period began to stand on firmer ground.⁷³

Pap. Soc. Ital. 849 appeared to be able to shed light on Democritus' linguistic interests. Attention was drawn to this papyrus by Coppola (1925), who observed that it conserved remains (68 lines altogether) of a piece dealing with grammar full of verb conjugations, arguing that its subject was the latter. Körte (1927) 270 followed the same line of argument. Wouters (1970) 247 n. 44 later noted that 'les abréviations très nombreuses dans le P.S.I. 7. 849 (= Pack² 2155) pourraient indiquer qu'il s'agit d'un texte érudit'. Subsequently he maintained that the subject of the papyrus was *On the Augment of the Verbs*: fr. 1 recto dealing with compound verbs followed by a preposition, then those beginning with a vowel, followed by those beginning with a consonant; it was thus clearly a 'very detailed and scholarly' treatise: cf. Wouters (1979) 253–262. It should be noted that all these scholars were mainly referring to fr. 1. More recently Holwerda (1983) shifted attention to fr. II, which he suggested was a doxographic piece. He completed *δημοκ* (in l. 47 of fr. II recto) as *Δημόκ[ριτος]*, and, recalling Aristot. *De gen. anim.* 764a6–11, besides Censorin. 6, 5 and Aët. V 7, 6 (= *Dox. Gr.* 420) (= 68 A 143 DK), tried to prove that the repeated references in the papyrus to the masculine/feminine pair did not concern a grammatical distinction between the letters of the alphabet, but the problem of deciding on the sex of the foetus. Manetti (1992) 18–19 followed the

⁷¹ Cf. Fronmüller (1901) 15–16.

⁷² Cf. Alfieri (1936) 208 n. 525, who kept 'parole' (words) in his Italian translation of the title, though pointing out 'that "locuzioni poetiche" (poetic phrases) should be understood', since Democritus had devoted his *Περὶ ῥημάτων* to words from the grammatical point of view, while *Ὀνομαστικόν* concerned words from a lexical one. Cf. Momigliano (1969) 157.

⁷³ Cf. Brancacci (1996) 113–119.

same line of argument. While fr. I almost certainly appears to be part of a grammatical work, with its high frequency of terms from the field (χαρακτήρ, φωνήεν, σύμφωνος, φωνή, ἰσοσυλλαβεῖν and others), fr. II, the only one in which reference to Democritus appears feasible, could have been part of a work dealing with embryology or physiology.

*On Homer or the correct choice of words and on obscure terms (ΠΕΡΙ ΟΜΗΡΟΥ
Η ΟΡΘΟΕΠΕΙΗΣ ΚΑΙ ΓΛΩΣΣΕΩΝ)*

The original title will have been *On Homer*, but, as has already been pointed out, this subtitle, presumably added by Thrasyllus, is appropriate and necessary, because it showed the critical rather than biographical character of the work.⁷⁴ Friedel suppressed ῥ, eliminating the subtitle and producing the title: Περὶ Ὅμηρου ὀρθοεπείης καὶ γλωσσέων.⁷⁵ The term ὀρθοεπεία shows the connection between the interests of Democritus and those proper to the Sophists: a piece with the same title was attributed by Plato to Protagoras, and the theme of ὀρθοεπεία was central both in Protagoras and Prodicus.⁷⁶ Nevertheless, the distance between Protagoras and Democritus was considerable. While for the former it meant a process of semantic analysis linked with dialectics, the latter saw it as stylistic and linked with aesthetics. Equally, while Protagoras' study of Homer was linked with his interest in developing the study of grammar, in Democritus it illustrated particular poetic conceptions, or was the terrain of exegesis of an allegorical type connected with ethics (e.g. Eustath. *ad Od.* ο 376 p. 1784 = 68 B 24 DK). The term γλῶσσαι referred to such obscure expressions as Aristotle (*Rhet.* III 3. 1406b2) was to consider appropriate for the solemn (σεμνόν), grandiose character of epic poetry (cf. *Poët.* 1459a9). The whole subtitle shows that for Democritus recognition of the spontaneous character of composing poetry goes hand in hand with examination of its technical-stylistic aspect.⁷⁷

⁷⁴ Cf. Fronmüller (1901) 9.

⁷⁵ Cf. Friedel (1875) 9 n. 23.

⁷⁶ On this aspect of Protagoras' philosophy cf. Brancacci, in Dixsaut–Brancacci (2002) 169–190.

⁷⁷ Cf. Webster (1939) 174; Wehrli (1946) 23; Lanata (1963) 260.

5. *Poetry and Poetic Theory*

Two fragments about Democritus' conception of poetry have survived, which are especially valuable for their dense content and rich terminology. They must be investigated before turning to the indirect testimonies, whose scrutiny can be expected to be fruitful only if one has previously assembled a few independent hints concerning Democritus' thought. The first text to be examined is that given by Clement of Alexandria:

[9] And Democritus also said: 'Everything the poet writes in a state of enthusiasm and divine inspiration is truly beautiful...'.⁷⁸

The term ἐνθουσιασμός belonged to the religious, or rather divine sphere, as was also confirmed by the subsequent ἱερὸν πνεῦμα, but neither the one expression nor the other referred to a pure state of delirium or mystical rapture: both, especially the second, are clarified in the light of Democritus' physics, in particular, in the light of the εἶδωλα and the so-called divine εἶδωλα. But it should be noted that it is possible to posit a distinction between the two expressions: ἐνθουσιασμός referred to the subjective feature of poetic inspiration, i.e. the aspect owing to which it was subjectively felt by the poet, while ἱερὸν πνεῦμα denominated the divine external cause of this condition. Perhaps the most important text for the correct interpretation of the fragment was preserved by Sextus Empiricus and is worth quoting immediately:

[10] Democritus states that some simulacra are close to men and that there are some that bring good and others bad luck: therefore he is

⁷⁸ Clem. Al. *Strom.* VI 168 (= 68 B 18 DK): καὶ ὁ Δημόκριτος ὁμοίως· ποιητὴς δὲ ἄσσα μὲν ἂν γράφῃ μετ' ἐνθουσιασμοῦ καὶ ἱεροῦ πνεύματος, καλὰ κάρτα ἐστίν. The context of the quotation from Democritus requires comment. Clement argued that Christian teaching would last over time, and, despite widespread attempts to wipe it out, was ever more flourishing 'even though it was prophesied that it would be persecuted forever. Now Plato wrote of poetry that "the poet is a light, sacred being and is unable to compose poetry unless he is possessed by God and mad". And Democritus also said: "Everything the poet writes in a state of enthusiasm and divine inspiration is truly beautiful". We know what the poets say. Thus shall we not be struck in the face of the poets of Almighty God, who were instruments of the divine voice?'. As can be seen, Clement echoed the tradition we shall examine later (cf. notes 90–91) that tended to associate Plato with Democritus on the basis of their conceptions of poets and poetry. But what distinguishes him is that he did not restrict himself to generic associations and assimilations, but actually *quoted* the texts, first including a fragment from *Ion* (534 b) and then one of Democritus. Moreover, unlike Cicero, he quoted Democritus and Plato *separately*, without lumping them together.

hopeful that he will encounter simulacra bearing good omens (εὐλόγων τυχεῖν εἰδώλων). These simulacra are large, of great height, and not easily dissolvable, without being actually immortal; they predict the future for men, appearing to them and emitting sounds. It can thus be explained how the ancients, receiving the sensible representations of these beings, imagined that this represented divinity, since no other god endowed with a divine nature existed beyond these beings.⁷⁹

In my view, Democritus' overall conception can be reconstructed as follows: For Democritus all perceptions consisted in penetration into the perceiving subject of εἶδωλα, which were either positive or negative. In B 166 DK he hoped that he would be endowed with 'favourable εἶδωλα', and a similar motive is, as we shall see, also present in the second important fragment about poetic theory. Men were not equally open, however, to the reception of εἶδωλα, for which a well proportioned mixture of hot and cold in the perceiving subject's body was necessary, viz. in such a way as to allow penetration of images on the basis of the principle of attraction of like to like. Poetic creation was based, on the one hand, on the possibility the poet was endowed with the ability of receiving beautiful images, and, on the other, on the fact that these images flowed to the poet from the divine world surrounding him.

For a complete picture of poetic theory it is now necessary to read the rich fragment preserved by Dio Chrysostom:

[11] Democritus had this to say about Homer: 'Homer, having been endowed with a nature that was sensitive to divine influence, built up a harmonious construction of words of every kind'.⁸⁰

Homer was endowed with (λαχών) a divine nature, or rather one sensitive to divine influence, because sensitive to 'divine inspiration', and this φύσις was his subjective nature as a poet, i.e. being capable of feeling ἐνθουσιασμός. It should be noted that the term λαχών in this fragment may be connected with the term εὐλογχος in B 166 DK, where it is

⁷⁹ Sext. Emp. *Adv. math.* IX 19 (= 68 B 166 DK). On this text see Vlastos (1945) 581 n. 24; Morel (1996) 314 and 445; Salem (2002) 294–295.

⁸⁰ Dio Chrysost. *Orat.* LIII 1 (= 68 B 21 DK): ὁ μὲν Δημόκριτος περὶ Ὁμήρου φησὶν οὕτως · "Ὁμηρος φύσεως λαχὼν θεαζούσης ἐπέων κόσμον ἐτεκτίνετο παντοίων. Dio goes on saying: 'thus indicating his belief that without a divine and demonic nature (ἀνευ θείας καὶ δαμονίας φύσεως) it is impossible to produce verses of such beauty and wisdom (καλὰ καὶ σοφὰ ἔπη)'. On Dio's interpretation of Democritus' aesthetics cf. Valgimigli (1912) 1–2. On Dio's literary criticism cf. D.A. Russell, *Criticism in Antiquity*, London 1981, 76–77 and M. Di Florio, 'Tra Aristofane e Menandro: per un'estetica del comico in Dione di Prusa', in AA.VV., *Ricerche su Dione di Prusa*, Napoli 2001, 65–84. On Democritus' concept of φύσις see Morel, above.

stated that Democritus hopes that simulacra bearing good omens will come his way (εὔχεται εὐλόγῳ τυχεῖν εἰδώλων). But, as such, Homer was able to build up a harmonious set of words of every kind (ἐπέων κόσμον παντοίων): and these correspond to the καλὰ κάρτα in B 18 DK. The way was thus open for a synthesis of φύσις and τέχνη (both required by the art of poetry) in Democritus' poetics. Insistence on ἔπη, characteristic of B 21 DK, should not escape us, all the more since it is rendered more marked by realising that it is a question of παντοῖα ἔπη, indicating *varietas*, i.e. ποικιλία, of perfect poetic creation. In B 18 the use of the verb γράφειν, indicating that this was creation of a written work, and the very presence of the term ποιητής, substituting the Pindaric σοφός and Homeric αἰιδός, corresponded to this motive. Democritus' poet *wrote* μετ' ἐνθουσιασμοῦ, was acquainted with the variety of terms, ὀρθοεπεῖη and γλῶσσαι, and possessed a poetic technique with which he constructed the unity of poems. All this shows that the term ἐνθουσιασμός, which made its first appearance in Democritus as far as we know from the evidence available, indicated intensification of the poet's ability, and not a kind of possession or mystic rapture.⁸¹ Dodds' view, attributing to Democritus 'the doubtful honour' of having introduced into literature the idea of poetry as a revelation that was alien and superior to reason and the image of the poet as a separate being from common humanity, subject to extraordinary inner experiences, could not be further from the truth and more arbitrary.⁸²

The information supplied by Horace may prove useful at this point:

[12] Since Democritus thought genius was more fruitful than miserable artistic practice, and banned mentally sane poets from Mount Helicon [...].⁸³

Undoubtedly, Horace was communicating what he knew of Democritus' thought with his own terminology and from his viewpoint.⁸⁴ Nev-

⁸¹ As I have already noted, the term ἐνθουσιασμός only appeared in Clement of Alexandria in his quotation of the Democritus fragment and nowhere else. For the term ἐνθουσιασμός see also Plat. *Tim.* 67 E 5–6 (διὰ τινὰ ἐνθουσιασμόν παραλλάξας). The irrationalist exegesis of Democritus' conception of poetry to be found partially in Sperduti (1950) 238, and especially in Dodds (1951) 81–82, cannot be accepted: above all, it was not based on the fragments but on Cicero (cf. notes 90–91). Delatte's views are better documented and less strong: cf. Delatte (1934) 37–51.

⁸² Cf. Dodds (1951) 82.

⁸³ Horat. *De arte poet.* 295–297: *Ingenium misera quia fortunatius arte / credit et excludit sanos Helicone poetas / Democritus [...]* (= 68 B 17 DK). Cf. Id. *Epist.* I 12, 13: [*Democritus*] *dum peregre est animus sine corpore velox.*

⁸⁴ On Horace's opinion of Democritus see Tate (1928) 65–73; Ferrero (1953) 79;

ertheless, his reference to the primacy of ingenium, into which Democritus' thesis was translated, and the last part with its reference to 'sani poetae', whom the latter would have liked to ban from Mount Helicon, was important. The presence of μέν in the expression ποιητῆς δὲ ἅσσα μὲν ἂν γράφῃ in B 18 DK has already been noted. This leads us to believe that the Democritus fragment contained an antithesis, and that, after the expression καλὰ κάττα ἐστίν, it continued with a reference to the works of poets that had not been written μετ' ἐνθουσιασμοῦ and thus were not 'truly beautiful', i.e. were not poetic works. Now, Horace may have preserved a trace of this thought in his expression 'banned mentally sane poets from Mount Helicon'. Beside the novelty of Democritus' conception, one should note the rich connections with and recollections of the previous poetic and philosophical tradition, also expressed in the extremely dense technical terminology. The motive of the poet as τέκτων was already to be found in Pindar, who in the *Third Pythian Ode* elaborated his hymns as τέκτων σοφός, while, in the *First Olympian Ode*, the verb δαιδάλλειν, together with the adjective ποικίλος, indicated the poet's expert industriousness, who was able to choose the manifold variety of the elements contributing to the formation of the unity of poetry.⁸⁵ The concept of a harmonious synthesis realised by poetry was expressed in Democritus by the term κόσμος, originally Homeric and then Pindaric; and the *iunctura* ἐπέων κόσμος is paralleled in Solon and Parmenides.⁸⁶ This complex continuity and innovation relationship can also be noted at the theoretical level. Fr. 18 DK contains the earliest reference in Greek literature to the term ἐνθουσιασμός, but the idea expressed by it, which should be linked with θεάω in B 21 DK, referred back to the most ancient Greek poetry: to Homer, in whom θεά was responsible for poetic narration and the Muses the guarantors of human knowledge, the depositaries of knowledge itself; to Hesiod, for whom the Muses of Mount Helicon were the

Lanata (1963) 254–255. On Horace's poetics see P. Grimal, *Horace, Art poétique. Commentaire et étude*, Paris 1964; C.O. Brink, *Horace on Poetry*, 2: *The Ars Poetica*, Cambridge 1971.

⁸⁵ Cf. Pind. *Pyth.* III 113; *Ol.* I 29–31. For δαιδάλλειν and ποικίλον cf. also *Ol.* I 105; V 20–21; VI 86–87; *Né.* V 42; XI 18. For an acute investigation on the various terms of the δαιδάλλειν family in Homer and Hesiod, as well as the figure of the craftsman in archaic Greece, see Frontisi-Ducroux (1975), especially 29–82.

⁸⁶ Cf. Solon fr. 2 D (V. 2: κόσμον ἐπέων ᾠδὴν ἄντ' ἄγορῆς θέμενος); Parmen. 22 B 8 DK (V. 52: κόσμον ἐμῶν ἐπέων). Cf. also Empedocl. 31 B 17 DK (v. 26: σὺ δ' ἄκουε λόγου στόλον οὐκ ἀπατηλόν), which in turn recalled Parmenides.

goddesses who could not only tell many half true lies, but also proclaim the truth: the goddesses who realised their election and poetic initiation thanks to unforgettable experience.⁸⁷ For Democritus, however, divine inspiration no longer assured, as with the *poets* Homer and Hesiod, the *truth* of the poetic work, but its *beauty*: beautiful—not true—are all the things that the poet may write, driven by enthusiasm and divine breath.

There are also a number of references to Democritus' poetics in Cicero.⁸⁸ They have a common characteristic, i.e. an assimilation between Democritus and Plato, an initial reason for treating them with great caution. The second reason is that this assimilation cannot be separated from a more general link between the two proposed in antiquity and which has complex historiographical and theoretical motivations, as part of the use made of Democritus and Plato (and others) by Arcesilaus in support of his scepticism, of the Epicureans' attacks on the two on account of the alleged sceptical features of their works, and, finally, in their sceptically oriented interpretation by Sextus Empiricus who referred back to Plato's vision proper to the Academics.⁸⁹ Even though assimilation between Democritus' poetics and the presumed poetics of Plato appears to be independent of this tradition, it is reasonable to argue that Cicero (and his Academic or Hellenistic sources), at least partially, reflected this background:

[13] I have often heard it said (they say that this was left by Democritus and Plato in their writings) that no one can be a good poet without a daring spirit and without a breath, let us say, of madness.⁹⁰

⁸⁷ For Homer cf. A 1 and B 484–486, for Hesiod cf. *Theog.* 26–28, on which see Luther (1935) 124–125; Luther (1958) 75–107; Minton (1962) 188–212; Accame (1963). Mayer (1933) is still important.

⁸⁸ For Democritus' influence on Cicero cf. Swoboda (1962) 64–85.

⁸⁹ The problem of the relations between the sceptical Academy and Plato has been thoroughly discussed by scholars. It is enough here to mention J. Glucker, *Antiochus and the late Academy*, Göttingen 1978, 31–64; J. Annas, 'Plato the sceptic', in P.A. Vander Waerdt (ed.), *The Socratic Movement*, Ithaca–London 1994, 309–340; C. Lévy, 'La Nouvelle Académie a-t-elle été antiplatonicienne?', in M. Dixsaut (ed.), (1993) *Contre Platon*, 1: *Le platonisme dévoilé*, Paris 1993, 139–156; C. Brittain, *Philo of Larissa. The Last of the Academic Sceptics*, Oxford 2001; M. Bonazzi, *Academici e Platonici. Il dibattito antico sullo scetticismo di Platone*, Milano 2003, all of whom provide further bibliographical information. For the link posited between Democritus and Plato in Sextus Empiricus cf. *Adv. math.* VIII 6–8; 56 and 60; 62.

⁹⁰ Cic. *De orat.* II 46, 194 (= 68 B 17 DK): *Saepe enim audiui poetam bonum neminem—id quod Democrito et Platone in scriptis relictum esse dicunt—sine inflammatione animorum existere posse et sine quodam adflatu quasi furoris*. Conclusions need not be drawn from the cautious words 'esse dicunt' (attributing them to Cicero himself): they were put into the mouth of Antonius, who, throughout *De oratore*, insisted on his poor knowledge of Greek literature

[14] Democritus said that no one can be a great poet without madness, as did Plato.⁹¹

The reference to Plato particularly concerned *Ion* and, secondly, *Phaedrus*.⁹² But assimilation with Democritus took place by passing over a clear difference: Democritus, as we have seen, elaborated his conception of the poet as sensitive to divine influence in positive terms, so as to justify the value of poetry and the excellence of the inspired poet; on the contrary, all the line of argument in *Ion* had as its end criticism of poetry, which Plato denied the status of a τέχνη. Moreover, while Democritus accepted the importance of poetic technique and did not mention 'madness' (*furor*, μανία), Plato brought poetry back to a θεία μανία and, in *Ion*, insistently denied any role for τέχνη.⁹³ All this also means that it is possible or rather probable that, in *Ion*, Plato took note of Democritus' conception (and not only this), especially for instrumental reasons,⁹⁴ but that this Platonic dialogue cannot be used to reconstruct Democritus' teachings.

and philosophy, and who, very gallantly, never missed an occasion for self irony and modesty (cf., for example, II 42, 180; II 35, 151; II 36, 156; II 42, 178).

⁹¹ Cic. *De divin.* I 38, 80 (= 68 B 17 DK): *negat enim sine furore Democritus quemquam poetam magnum esse posse, quod idem dicit Plato.*

⁹² Cf. Plat. *Ion* 533 E –524 D. Cf. also the important passage in *Phaedr.* 245 A and recall also *Leg.* 719 C 1–5: 'Lawgiver, there is an ancient myth, which we never tire of repeating and which is universally accepted, according to which, when the poet sits on the Muse's tripod, he is out of his mind (τότε οὐκ ἔμφρων ἐστίν), but, as his source, spontaneously lets what arrives flow on [...]'.
⁹³ Cf., especially, *Ion* 533 D 1–3: τέχνη μὲν οὐκ [...] θεία δὲ δύναμις; 533 E 6–7: οὐκ ἐκ τέχνης ἀλλ' ἐνθεοὶ ὄντες καὶ κατεχόμενοι; 534 B 8–C 1: οὐ τέχνη [...] ἀλλὰ θεία μοῖρα; 534 C 5–6: οὐ γὰρ τέχνη ταῦτα λέγουσιν, ἀλλὰ θεία δυνάμει. Cf. also Plat. *Apol.* 22 B 9–C 2, where Socrates said that he had realised that poets οὐ σοφία ποιοῖεν ἀ ποιοῖεν, ἀλλὰ φύσει τινὶ καὶ ἐνθουσιάζοντες ὥσπερ οἱ θεομάντεις καὶ οἱ χρησμοδοί. Cf. also *Meno* 99 C 11–D 5.

⁹⁴ Cf. Plat. *Ion* 533 E 3–5: οὕτω δὲ καὶ ἡ Μοῦσα ἐνθέους μὲν ποιῇ αὐτὴ, διὰ δὲ τῶν ἐνθέων τούτων ἄλλων ἐνθουσιάζόντων ὁρμαθὸς ἐξαεῖται. For Democritus' theme of καλὰ κάρτα cf. *Ion* 533 E 7: τὰ καλὰ λέγουσι ποιήματα; 534 A 2: τὰ καλὰ μέλη; 534 B 8: πολλὰ λέγοντες καὶ καλὰ. For reference to Democritus in *Ion* cf. Flashar (1958) 56 n. 4; Méridier (1978) 14. On the conception of poetry in *Ion* see Pöhlmann (1976) 191–208, Heitsch (1990) 243–259, Morris (1993) 265–272, to which I refer readers for further bibliography.

LE DEMOCRITE TECHNICIEN.
REMARQUES SUR LA RECEPTION DE DEMOCRITE
DANS LA LITTERATURE TECHNIQUE*

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1. *Introduction*

Le présupposé, explicite ou implicite, qui a affecté la compréhension des Présocratiques au XIXe siècle, présupposé selon lequel ceux-ci sont des philosophes qui ont développé des systèmes cohérents et appliqué leurs principes fondamentaux à tous les domaines de leur enquête, a également influencé le jugement que l'on a porté sur les œuvres techniques de Démocrite. S'il n'y a pas de trace d'atomisme dans les témoignages sur Démocrite ou si ceux-ci ne peuvent être reliés d'une façon ou d'une autre à sa théorie générale, ils sont tenus pour suspects ou sont tout simplement rejetés. Un philosophe comme Démocrite ne pourrait pas avoir traité d'agriculture. Tel est, par exemple, le présupposé des philologues allemands qui se sont occupés des œuvres techniques de l'Abdéritain à la fin du XIXe siècle. E. Oder, dans son article fondamental sur l'histoire de l'agriculture en Grèce ancienne, avait explicitement formulé ce principe en niant la paternité démocritéenne de l'écrit *Περὶ γεωργίας* qui, dans le catalogue de Thrasyllé, apparaît dans la liste des œuvres authentiques.¹

Wellmann, dans son fameux article sur les *Georgika* de Bolos,² s'était déclaré pleinement d'accord avec ce principe et avait classé sous le nom de Bolos tous les témoignages concernant les prévisions astronomiques et l'agriculture, que l'on trouve non seulement dans les *Geoponica* mais aussi chez les auteurs latins. Les *Vorsokratiker* de Diels ont été influencés sur ce point par les recherches de Wellmann et leur prestige a mis fin, pour tout le XXe siècle, au débat sur l'authenticité des témoignages des *Geoponica* et des auteurs d'agriculture et de médecine. La question

* Je remercie Pierre-Marie Morel pour la révision de mon texte français.

¹ Oder (1890) 76.

² Wellmann (1921) 4.

a été posée de nouveau dans un article récent de D. Sider,³ qui a attiré l'attention sur la chose suivante: rien n'empêche que les prévisions météorologiques générales que l'on trouve surtout dans le douzième chapitre du premier livre des *Geoponica* remontent à Démocrite lui-même, et qu'elles aient été utilisées par Théophraste dans son *De signis*.

Je voudrais ici me borner à faire quelques observations sur le contexte culturel dans lequel Démocrite a écrit ses œuvres techniques et sur l'image que donne de lui la littérature technique (en particulier la littérature médicale et la littérature relative à l'agriculture) de l'hellénisme tardif et de l'époque impériale. C'est dans ce cadre que je voudrais poser de nouveau la question de l'évaluation des témoignages classés sous le nom du Pseudo-Démocrite. Je dois être très sélective sur ce point parce qu'on a classé sous le nom de Pseudo-Démocrite une masse hétérogène d'écrits et de témoignages, dont quelques exemples ne suffisent pas à traduire la complexité. Toutefois, avant de traiter ces questions, je voudrais présenter une image générale de la littérature technique dans le dernier quart du Ve siècle avant J.-C., en me plaçant du côté des techniciens professionnels.

2. *Le Démocrite technicien. Le contexte culturel du dernier quart du Ve siècle av. J.-C.*

L'âge de la sophistique est caractérisé par une certaine spécialisation, mais aussi par son contraire, le savoir global. *Polymathie* et savoir technique marchent côte à côte, mais ils s'affrontent souvent sur le terrain de la communication et du rapport avec le public. Les symptômes de cette confrontation apparaissent de manière manifeste dans plusieurs traités hippocratiques.⁴ Les médecins se défendent contre l'invasion des 'savants' dans leur domaine, contre ceux qui, à leurs yeux, n'ont qu'une connaissance théorique de la médecine, sans l'avoir jamais pratiquée. Ceux-ci ne sont pas de vrais médecins et ne sont pas non plus capables de soigner, mais donnent aux profanes l'impression qu'ils peuvent le faire. Il s'agit là d'un argument qui n'est pas limité à la littérature médicale. Xénophon, dans son *Économique* (XVI 1), fait prononcer à

³ Sider (2002).

⁴ Voir, sur ce point en particulier, Ducatillon (1977).

l'interlocuteur de Socrate, le propriétaire Ischomaque qui cultive lui-même son terrain, la critique de ceux qui, en écrivant sur l'agriculture, font de la théorie et prétendent que, pour pratiquer cet art comme il convient, il faut d'abord connaître la nature du terrain en général. Ischomaque objecte que ce n'est pas nécessaire: il suffit d'observer les terrains particuliers, par exemple les terrains des voisins, pour savoir ce qu'ils peuvent ou ne peuvent pas produire, et agir en conséquence.

Dans le *Lachès* de Platon (183 C), Stésileos, qui expose des *epideixeis* très savantes sur l'oplomachie, se rend ridicule dans une vraie bataille: son arme la plus puissante, une lance à faux, reste prise dans les cordages d'un navire de transport qui heurte le navire de guerre sur lequel il se trouve, et il n'arrive pas à la libérer; lorsque les deux navires s'éloignent, il doit contempler le spectacle pitoyable qu'offre sa lance pendue au cordage de l'autre navire. La faute de Stésileos tient à son manque d'expérience: il n'a pas prévu qu'une telle arme ne conviendrait pas à la bataille navale. Ses connaissances théoriques ne l'ont pas aidé dans la pratique de l'art.⁵ Tous les textes cités ci-dessus donnent une image du théoricien des arts qui, lorsqu'il parle ou écrit, peut se faire passer pour un spécialiste. Le vrai technicien ne pourra être reconnu qu'à l'épreuve de la pratique, mais, à ce moment-là, ce sera trop tard, selon le médecin hippocratique auteur du traité *De veteri medicina*.⁶ Les dialogues fictifs de Xénophon et de Platon se situent dans le dernier quart du Ve siècle; les traités hippocratiques qui traitent de ce sujet comme le *De veteri medicina* sont datés de la fin du cinquième siècle ou du début du IVe. Cela veut dire qu'à cette époque il y avait toute une floraison de discours et d'écrits techniques de non spécialistes, qui manifestaient cependant des connaissances techniques très poussées. C'est dans ce contexte que se sont développés les écrits démocritéens.

Démocrite est le premier savant dont la production livresque polymorphe est également de caractère technique. Thrasyllle le présente non seulement comme un *polymathês* mais aussi comme quelqu'un qui a une compétence dans tous les arts (Diog. Laert. IX 37 = 68 A 1 *περι τεχνῶν πᾶσαν εἶχεν ἐμπειρίαν*). C'était manifestement l'image courante de Démocrite au Ier siècle après J.-C. Toutefois, on peut remonter plus haut, au moins jusqu'au IIIe siècle avant J.-C. où l'on trouve,

⁵ On trouve une image comparable de sophiste (Dionysodore) qui se fait passer pour un maître de tactique militaire chez Xen. *Mem.* III 1, 1.

⁶ [Hippocr.] *Vet. med.* IX 5 (129, 4 Jouanna = I, 590 Littre).

appliqué à Démocrite, le modèle du théoricien des arts, également présent dans les traités hippocratiques, chez Xénophon et Platon. Il s'agit de la représentation du célèbre cuisinier dans un fragment du poète comique Damoxène (Fr. 2 K.-A.), dont une partie a été placée par Diels dans la section 'Imitations' [68 C 1]. Le cuisinier de Damoxène diffère des autres cuisiniers savants qu'on rencontre souvent dans la comédie moyenne et récente⁷ parce qu'il se réfère explicitement à Épicure et à Démocrite. Il se définit comme un élève d'Épicure, mais s'avère être plutôt un cuisinier démocritéen. Les aspects les plus intéressants de ce fragment sont:

1. une accentuation générale de la supériorité de la théorie sur la pratique de l'art.
2. En ce qui concerne les thèmes particuliers:
 - a. L'influence de la météorologie sur la constitution des animaux et ses effets sur l'homme qui les mange.
 - b. L'explication des mécanismes de digestion et de leurs conséquences pour la santé.

Le cuisinier épicurien explique à son interlocuteur qu'un cuisinier qui n'a pas lu et ne sait pas réciter par cœur toutes les œuvres de Démocrite et qui ne connaît pas le *Canon* d'Épicure doit être dédaigné, parce qu'il faut savoir quelle est la différence entre les maquereaux que l'on pêche en hiver et ceux que l'on pêche en été. Il faut aussi connaître quels poissons sont les plus avantageux au coucher des Pléiades (c'est-à-dire au commencement de l'automne) et au temps du solstice (c'est-à-dire en été), parce que les changements et les mouvements causent du mal aux gens, tandis que ce qu'on mange à la saison voulue procure un effet bénéfique. Alors, la nourriture est nourrissante, facile à digérer et elle peut être exhalée convenablement. Ainsi le jus alimentaire s'épand de manière égale dans tous les conduits (εἰς τοὺς πόρους ὁ χυμὸς ὁμαλῶς πανταχοῦ συνίσταται), comme le dit Démocrite,⁸ et l'on évite par là les blocages de conduits (ἐμφράγματα)⁹ qui provoquent la goutte. Le cuisi-

⁷ Cf. e.g. Alexis (IVe–IIIe siècle avant J. C.) Fr. 129, 140, 153 K.-A.; Nichomaque (IIIe siècle avant J. C.) Fr. 1 K.-A.; Sosipater (IIIe siècle avant J. C.) Fr. 1 K.-A.

⁸ Il s'agit en effet d'une expression qui pouvait être typiquement démocritéenne, cf. Theophr. *De sens.* 62 [68 A 135] (sur la constitution du plomb) τὸν δὲ μόλυβδον ἑλαττον ἔχοντα κενὸν ὁμαλῶς συγκεῖσθαι κατὰ πᾶν ὁμοίως. Cf. *ibid* 55 (sur la distribution de la voix qui entre dans le corps) ταχὺ σκίδνασθαι καὶ ὁμαλῶς κατὰ τὸ σῶμα. Sur l'attention que Démocrite avait prêtée aux sucs (un argument typiquement médical) cf. Theophr. *De caus. plant.* VI 2, 1 [68 A 130]; Id. *De sens.* 65ss. [68 A 135].

⁹ Sur l'obstruction des conduits, cf. Theophr. *De sens.* 66 [68 A 135] (sur la forme des

nier se présente ici, également, comme un médecin et un connaisseur de la nature en général (B. καὶ τῆς ἰατρικῆς τι μετέχειν μοι δοκεῖς. A. καὶ πᾶς ὁ φύσεως ἐντός). Il développe ensuite une série de considérations sur l'harmonie dans le mélange des aliments et donne de lui l'image d'un cuisinier qui ne s'abaisse pas à cuire lui-même les aliments. Il observe (46 θεωρῶ) ce que les autres font et explique les causes et les effets (47 λέγω τὰς αἰτίας καὶ τὰποβαῖνον) de ce qu'ils font. Épicure est bien cité par le cuisinier, mais c'est Démocrite qui est son autorité de référence lorsqu'il parle de choses techniques. De plus, l'image du technicien qui fait de la théorie est parallèle à celle que les médecins hippocratiques, Xénophon et Platon nous donnent des savants qui investissent le domaine des arts. Ce texte montre que l'image d'un Démocrite technicien était solidement établie dès le III^e siècle avant J.-C. et que son nom était mis en relation avec des théories médicales.

Cette image a aussi des bases réelles. Plusieurs titres du catalogue de Thrasyllé (dont l'originalité n'a pas à être remis en cause), montrent que Démocrite avait traité de sujets typiquement médicaux en investissant le champ des médecins professionnels. Il suffit ici de rappeler quelques exemples qui me semblent indiscutables, comme l'écrit *Du régime* (Περὶ διαίτης ἢ Διαιτητικόν) et la *Ἱητρικὴ γνώμη*. Les traités *Du régime* étaient très actuels à l'époque de Démocrite. L'auteur du traité hippocratique du *Régime des maladies aiguës* (dernier tiers du Ve siècle avant J.-C.) déplore que les médecins aient de la peine à se distinguer, auprès du public, des profanes qui traitent du même sujet: c'est surtout à propos du régime des maladies aiguës que ceux qui ne sont pas médecins paraissent être médecins.¹⁰ Le traité Περὶ διαίτης (fin du Ve—début du IV^e siècle avant J.-C.) se réfère à d'autres écrits qui l'ont précédé.¹¹ À propos du titre *Ἱητρικὴ γνώμη*, on peut remarquer que la γνώμη est l'in-

atomes de l'âpre) τὸν δὲ στρυφνὸν ἐκ μεγάλων σχημάτων καὶ πολυγωνίων καὶ περιφερῆς ἦκιστ' ἐχόντων· ταῦτα γὰρ ὅταν εἰς τὰ σώματα ἔλθῃ, ἐπιτυφλοῦν ἐμπλάττοντα τὰ φλεβία καὶ κωλύειν συρρεῖν διὰ καὶ τὰς κοιλίας ἰσάναι.

¹⁰ *Acut.* VI 1 (38, 6 Joly = II, 236 Littré) ἐπεὶ τοι μέγα σημείον τόδε, ὅτι οἱ δημότα ἀσυνετώτατοι αὐτοὶ ἐωυτῶν περὶ τούτων τῶν νοσημάτων εἰσὶν, ὡς μελετητέα ἐστὶ· οἱ γὰρ μὴ ἱητροὶ ἱητροὶ δοκέουσιν εἶναι μάλιστα διὰ ταύτας τὰς νούσους· ὁ γὰρ τὰ δὲ νόματα ἐκμαθεῖν, ὅποια νενόμισται προσφέρεσθαι πρὸς τοὺς τὰ τοιαῦτα κάμνοντας.

¹¹ *Vit.* I (122, 1 Joly² = VI, 466 Littré) εἰ μὲν μοι τις ἐδόκει τῶν πρότερον συγγραψάντων περὶ διαίτης ἀνθρωπίνης τῆς πρὸς ὑγίην ὀρθῶς ἐγνωκῶς συγγεγραφεῖν πάντα διὰ παντός, ὅσα δυνατόν ἀνθρωπίνῃ γνώμῃ περιληφθῆναι, ἱκανῶς εἶχεν ἂν μοι, ἄλλων ἐκπονησάντων, γνόντα τὰ ὀρθῶς ἔχοντα, τούτοις χρῆσθαι, καθότι ἕκαστον αὐτῶν ἐδόκει χρήσιμον εἶναι. Νῦν δὲ πολλοὶ μὲν ἤδη συνέγραψαν, οὐδεὶς δὲ πῶ ἔγνω ὀρθῶς καθότι ἦν αὐτοῖς συγγραπτέον· ἄλλοι δὲ ἄλλωι ἐπέτυχον· τὸ δὲ ὅλον οὐδεὶς πῶ τῶν πρότερον.

telligence du médecin, celle qui lui permet de faire une diagnose juste et de trouver le traitement approprié.¹² Ἱατρικὴ τέχνη ou λόγος περὶ τῆς τέχνης τῆς ἱατρικῆς étaient des dénominations tout à fait canoniques pour indiquer un développement théorique général sur la constitution des corps et sur les maladies. L'auteur de l'écrit hippocratique qui porte le titre (sans doute plus tardif) *De carnibus*, en traitant de la constitution de l'homme et de l'importance du nombre sept pour la croissance et le développement des maladies, se réfère à son œuvre comme à un λόγος περὶ τῆς τέχνης τῆς ἱατρικῆς.¹³ Ἱατρικὴ (scil. τέχνη) était le titre d'une œuvre de Ménécrate de Syracuse, un médecin-guérisseur du début du IV^e siècle avant J.-C. qui avait traité de la constitution de l'homme et des maladies.¹⁴

Il est possible que Démocrite ait exposé, dans ces traités, des théories physiques très générales, mais il est très probable qu'il y a surtout exposé sa connaissance détaillée des procédés techniques. S'il était un connaisseur des arts, on peut se demander dans quelle mesure ceux-ci peuvent avoir influencé la formulation de ses doctrines générales. Il s'agit d'une question très problématique. Je me contenterai de relever ici que les lexiques nous ont transmis un certain nombre de termes démocritéens empruntés aux arts.¹⁵ Revenons cependant à la réception de Démocrite, en particulier dans la littérature médicale et dans les écrits d'agriculture. Je ne voudrais pas ici traiter les sujets qui ont déjà été discutés dans d'autres études, c'est-à-dire la réception de Démocrite dans la médecine hippocratique et hellénistique et de son traité sur l'agriculture dans la littérature *de re rustica* en général. Je voudrais parler surtout de la réception en relation avec le problème des écrits pseudo-démocritéens. Les pseudo-*epigrapha* témoignent aussi d'un intérêt pour l'auteur imité et ils contiennent parfois un noyau de doctrine authentique. En réalité, les témoignages qu'on a classés comme pseudo-démocritéens ne dérivent pas tous de Bolos ou ne sont peut-être pas vraiment 'pseudo', comme le pensaient les savants allemands de la fin

¹² Cf. e.g. *De arte* 11, 2 (237, 11 Jouanna = VI, 20 Littré) ὅσα γὰρ τὴν τῶν ὀμμάτων ὄψιν ἐκφεύγει, ταῦτα τῇ τῆς γνώμης ὄψει κεκράτηται. *Aff.* 45 (68, 18 Potter = VI, 254 Littré) ὅσα δὲ ἐν τῇ τέχνῃ τῇ ἱατρικῇ γνώμῃ εὐρίσκεται ἥπερ οὐτίων ἢ φαρμάκων, παρὰ τῶν οἶων τε διαγιγνώσκειν τὰ ἐν τῇ τέχνῃ μανθάνειν χρὴ, ἣν τι θέλης μανθάνειν.

¹³ *De carn.* I 1 (188, 5 Joly = VIII, 584 Littré). Sur ce point Gubler (1995) 27.

¹⁴ Anon. Londin. col. XIX, 19 Μενεκράτ[η]ς δὲ ὁ Ζε[ὺς] ἐπικληθεὶς ἐν Ἱατρικῇ δ[ε] [ε]ἰξίν [τινα τ(ὸν)] σωματ(ων) ἐκτιθέμενος καὶ [μέλλ(ων) αἰτιολ(ογεῖν)] τὰ πάθη, πρότερον περὶ τ(ὸν) πο[ιοτήτων] πολυπραγιμον(ων) τ(ων) σωματ(ων), συν[εστάναι] λέγει τὰ σώματα ἐκ τ(ων) τεσ[σάρων] στοιχείων.

¹⁵ [68 B 122, 128; 130–137].

du XIX^e siècle. Peut-être peut-on également sauver quelque chose des ruines qui ont subsisté après la *Quellenforschung* destructive de Oder et Wellmann.

3. La réception de Démocrite dans la littérature médicale

La réception de Démocrite dans la médecine hippocratique a été déjà traitée par plusieurs auteurs.¹⁶ D'une manière générale, on s'est montré très optimiste en ce qui concerne l'influence démocratéenne sur les traités hippocratiques, parce que l'on est parti de l'idée que, étant un philosophe, il devait avoir développé, en premier lieu, des théories qui sont à la base de certains écrits du *corpus Hippocraticum*. Jouanna a déjà démontré que tel n'était pas toujours le cas: au contraire, il est possible que, dans certains cas, les hippocratiques et Démocrite traitent des mêmes sujets indépendamment, ou bien que Démocrite emprunte au savoir médical comme il l'a du reste fait avec d'autres arts.¹⁷ Le problème est très complexe et ne peut être traité ici. Je voudrais seulement signaler un emprunt lexical dans le *corpus* hippocratique, qui a sans doute été tiré de Démocrite et qui semble avoir échappé à ceux qui ont traité le sujet. Il s'agit de l'adjectif *ναστόν*, typique chez Démocrite pour désigner l'atome,¹⁸ mais qui pourrait bien avoir été employé aussi comme attribut des corps solides en général.¹⁹ Cet adjectif, inconnu par ailleurs

¹⁶ Cf. Lonie (1981); Stückelberger (1984); Salem (1996) 220–263; Orelli (1996).

¹⁷ Voir Jouanna (1990) 99ss. (qui n'a pas été pris en compte par Salem (1996) 242–245) à l'égard des exemples de naissances multiples qui sont évoqués dans le *De nat. puer.* XXXI 2 (83, 8 Joly = VII, 540 Littré) et attribués à Démocrite par Élien, mais qui visent à démontrer des thèses exactement contraires. Chez l'auteur du *De natura pueri* ces exemples prouveraient que les jumeaux naissent d'un seul coït; chez Démocrite, au contraire, qu'ils proviennent de plusieurs coïts et de plusieurs semences par superfécondation. S'il y a une relation, il s'agirait plutôt d'une relation de concurrence, 'ce qui n'est pas assuré, car le problème des jumeaux était un lieu obligé de l'embryologie' (104). Sur l'embryologie en général cf. Jouanna (1992) 386s.

¹⁸ Chez d'autres auteurs du Ve siècle avant J.-C. *ναστόν* désigne un gâteau, cf. Phe-recr. Fr. 113 K.-A.; Aristoph. *Av.* 567; *Pl.* 1142; Metagenes Fr. 6 K.-A. L'Etymologicum Magnum s.v. *ναστός* explique qu'il s'agissait d'un gâteau très compact truffé d'épices et de fruits séchés (*ναστός· ὁ πεπυλημένος ἄρτος, ὁ μεστός, πλήρης, καὶ μὴ ἔχον τι κοῦφον ἀπὸ τοῦ νάσσεσθαι ἀρτύμασιν ἢ τραγημασί τισι*).

¹⁹ Rien dans sa signification ne l'empêche et Démocrite parle aussi des corps solides et compacts cf. Sen. *Quaest. nat.* IV 9, 1 *Accedit his ratio Democriti: 'Omne corpus, quo solidius est, hoc calorem citius concipit, diutius servat. Itaque si in sole posueris aeneum vas et vitreum, aeneo citius calor accedet, diutius haerebit'. Adicit deinde quare hoc existimet fieri. 'His, inquit, corporibus*

avec cette signification, est employé dans un traité hippocratique qui date de la fin du Ve ou du début du IV^e siècle avant J.-C., le traité *Des glandes* (Περὶ ἀδῆνων).²⁰ L'auteur explique la différence entre le corps de l'homme et celui de la femme de la manière suivante:

En effet, le mâle est compact et comme une étoffe serrée, soit à l'œil soit au toucher; la femelle, par contre, est lâche et spongieuse et comme une laine soit à l'œil soit au toucher; de la sorte, ce qui est lâche et mou ne laisse pas partir l'humidité; au contraire, le mâle n'en recevrait même pas, étant dense et inhospitalier.²¹

Si l'on compare ce passage avec le passage parallèle sur la constitution des deux sexes dans le traité gynécologique *Sur les maladies des femmes* (dont l'auteur s'est probablement inspiré), on peut aisément constater que les mêmes concepts ont été exprimés là à l'aide d'une terminologie bien plus traditionnelle.²² De toute évidence, l'auteur du traité *Sur les glandes*, qui aime le style recherché et l'emploi de mots rares, a réutilisé consciemment l'adjectif démocriteen comme une marque de distinction.

À partir de la période hellénistique, l'intérêt des cercles médicaux pour Démocrite se développe dans trois directions:

1. un courant doctrinal à l'intérieur duquel on peut distinguer deux positions:
 - a. une reprise et une modification des thèses corpusculaires (Erasistrate et Asclépiade).

quae duriora et pressiora sunt necesse est minora foramina esse et tenuiorem in singulis spiritum'. *Pressiora* a l'air d'être une traduction parfaite de *ναστότερα*. Le passage n'a pas été retenu ni par Diels-Kranz ni par Lur'e, mais il a été remarqué par Stückelberger (1990) 2576.

²⁰ Sur les problèmes de datation cf. Joly (1978) 103–111. Le style de l'auteur présente des caractéristiques assez typiques de la prose de cette période pour qu'on puisse le considérer comme un faux remontant à la période hellénistique tardive.

²¹ [Hippocr.] *Gland.* XVI 2 (121, 22 Joly = VIII, 572 Littré) τὸ γὰρ ἄρσεν ναστόν ἐστι καὶ οἶον εἶμα πυκνὸν καὶ ὀρέοντι καὶ ἐπαφομένῳ· τὸ δὲ θήλυ ἀραιὸν καὶ χαῦνον καὶ οἶον εἶριον ὀρέοντι καὶ ἐπαφομένῳ ὥστε τὴν ὑγρασίην οὐ μεθίησι τὸ ἀραιὸν καὶ μαλθακόν· τὸ δὲ ἄρσεν οὐκ ἂν τι προσδέξατο, πυκνὸν τε ἐὼν καὶ ἀστεργές.

²² [Hippocr.] *Morb. mul.* I 11 (88, 24 Grensemann = VIII, 12 Littré) φημὶ τὴν γυναῖκα ἀραιοσαρκωτέραν καὶ ἀπαλωτέραν εἶναι ἢ τὸν ἄνδρα [...]. καὶ γὰρ εἴ τις ὑπὲρ ὕδατος ἢ καὶ χωρίου ὑδροῦ δύο ἡμέρας καὶ δύο εὐφρόνας θείῃ εἶρια καθαρά καὶ εἶμα καθαρὸν καὶ βεβυσμένον εὐστάθμως ἴσον τοῖσιν εἰρίοισιν, ἀνελὼν εὐρήσει στήσας πολλῶι βαρύτερα τὰ εἶρια ἢ τὸ εἶμα [...] οὕτω δὲ καὶ ἡ γυνή, ἅτε ἀραιωτέρα εὐῶσα, εἰλκυσε πλέον ἀπὸ τῆς κοιλίης τοῖσι σώματι τῆς ἱκμάδος καὶ θάσσοι ἢ ὁ ἀνὴρ [...] ὁ δὲ ἀνὴρ στερεοσαρκότερος ἐὼν τῆς γυναίκος [...]

- b. une tendance, à l'intérieur de la médecine empirique, qui cherche dans l'œuvre de Démocrite les confirmations de son épistémologie et de sa méthode.
- 2. Un courant plus technique qui a transmis des citations isolées et des *doxai* sur la biologie et l'embryologie, dont témoignent le soi-disant Aétius et Galien, ainsi que d'autres auteurs de la période impériale.
- 3. Une réception qui se rattache à la littérature pseudo-démocritéenne.

3. *Une réception qui se rattache à la littérature pseudo-démocritéenne*

Le premier point concerne la doctrine atomiste et l'épistémologie en général et c'est justement ce dont je ne voudrais pas parler ici. En ce qui concerne le deuxième point, je traiterai deux cas, qui me semblent également intéressants pour le troisième point, c'est-à-dire la réception, dans les cercles médicaux de l'époque impériale, de Démocrite et des écrits considérés comme pseudo-démocritéens.

3 A. *Citations et doxai de Démocrite dans la tradition médicale [68 B 32; A 107]*

Stückelberger (1974) a montré qu'Asclépiade de Pruse, médecin peut-être un peu bavard si l'on en croit Pline l'ancien, actif à Rome au I^{er} siècle avant J.-C., comptait Démocrite parmi ses modèles théoriques. Il y a de bonnes raisons de penser qu'Asclépiade et ses disciples font partie des démocritéens dont parlent les sources anciennes comme Cicéron et Plutarque. Pourtant, l'intérêt pour Démocrite dans les cercles médicaux ne se limite pas à Asclépiade. La transmission du fameux fragment sur l'acte sexuel et une *doxa* sur l'âme attribuée à Démocrite sont à cet égard très intéressants.

À l'époque impériale, on cite beaucoup la fameuse définition démocritéenne de l'acte sexuel:

L'acte sexuel est une petite apoplexie; en effet un homme bondit d'un autre homme et s'en arrache, séparé comme par un coup [68 B 32].

Cette citation, telle qu'elle est présentée par Diels-Kranz, n'est toutefois attestée nulle part sous sa forme complète. Stobée, qui dans ce cas puise aux *Gnomologia*, en cite seulement la première partie dans

les Éclogues éthiques.²³ Hippolyte de Rome s'y réfère implicitement, mais il cite seulement la deuxième partie. Il ne l'attribue pas à Démocrite mais à un hérésiarque, Monoimos l'Arabe, un représentant des *Doketai*. Celui-ci l'avait citée dans une exégèse allégorique des plaies d'Égypte. Le bâton avec lequel Moïse cause les plaies représenterait le iota, c'est-à-dire la décade créatrice, et le coup de bâton serait à chaque fois une action créatrice.²⁴ On peut se demander par quels canaux la citation est arrivée à Monoimos, le seul qui reproduisait la deuxième partie tout entière. En tout cas, le passage de Stobée est le seul texte qui donne la leçon ἀποπληξίη; le texte d'Hippolyte, qui se réfère au 'coup', la sous-entend. Chez tous les autres auteurs de l'époque impériale on trouve ἐπιληψίη. En outre, aucun d'eux ne donne la citation complète: elle est soit coupée, soit paraphrasée. Elle apparaît toujours dans des contextes où l'on juge négativement l'acte sexuel du point de vue médical: il serait dangereux parce qu'il est semblable à l'épilepsie. Pline cite seulement une petite partie,²⁵ mais ajoute que l'acte sexuel est parfois profitable pour les athlètes, parce qu'il les détend et les régénère, ainsi que comme remède à certaines maladies. Sabinus, un médecin du début du IIe siècle après J.-C., commentateur d'Hippocrate et cité par Galien, l'avait paraphrasée pour démontrer que les jeunes gens qui commencent à avoir des rapports sexuels sont particulièrement sujets aux maladies.²⁶ Gellius, à peu près contemporain de Sabinus, attribue

²³ Stob. III 6, 28 [527 L.] Ξυνοουσίη ἀποπληξίη σμικρή· ἐξέσσεται γὰρ ἄνθρωπος ἐξ ἀνθρώπου. Sur l'autre version de la citation chez Stobée qui remonte à la doxographie médicale et non aux *Gnomologia*, cf. ci-dessous.

²⁴ Hippol. Ref. VIII 14, 3 αὕτη (δέ), φησίν, ἐστὶν ἡ δεκάπληγος ἢ κοσμικὴ κτίσις· πάντα γὰρ πληροσόμενα γεννᾶται καὶ καρποφορεῖ, καθάπερ αἱ ἄμπελοι. "ἄνθρωπος (γὰρ) ἐξ ἀνθρώπου ἐξέσ(σ)εται", φησίν, "καὶ ἀποσπᾶται, πληγῇ τινι μεριζόμενος", ἵνα γένηται.

²⁵ Plin. Nat. hist. XXVIII 58 [68 B 32] *Venerem damnavit Democritus, ut in qua homo alius exiliret ex homine*. C'est la même paraphrase raccourcie que l'on trouve aussi chez le Pseudo-Galien *An animal sit*. XIX 176 K. [527 L.] φησὶ δὲ καὶ Δημόκριτος ἄνθρωπον ἐξ ἀνθρώπου ἐξέσσυσθαι.

²⁶ Galen. In Hipp. epid. VI (XVII B, 28 K) οἱ μὲν περὶ τὸν Σαβῖνον οὐκ ἀλόγως φασὶ τοῖς ἀφροδισιάζουσιν ἀρχομένοις τοῦτο συμβαίνειν· πρῶτον μὲν ὅτι μέγας ὁ ξενισμὸς γίνεται περὶ τὸ σῶμα (γράφουσι γὰρ οὕτως αὐτοί), δι' ὃν ξενισμὸν φασὶν ἐπιληψίαν τε καὶ νεφρίτιδας αὐτοῖς ἑτερά τε χρόνια γίνεσθαι· ἔπειτα δὲ καὶ ὅτι Δημόκριτος εἶπεν "ἄνθρωπον ἐξ ἀνθρώπου ἐν ταῖς συνουσίαις ἐκθόρνυσθαι". Cf. Galen. In Hipp. epid. III (XVII A, 521 K) συμβαίνει τοῖς ὁψιμαθέσιν ἐναντιώματα λέγειν ἀκαίρως φλυαροῦσιν. τίς γὰρ ἦν ἀνάγκη γράφειν Δημόκριτον μὲν εἰρηκέναι μικρὰν ἐπιληψίαν εἶναι τὴν συνουσίαν, Ἐπίκουρον δὲ μηδέποτε μὲν ὠφελεῖν ἀφροδισίων χρῆσιν, ἀγαπητὸν δ'· εἰ μὴ βλάψειεν; ἐπὶ γὰρ τῶν ἐξ ἀφροδισίων ἀμέτρων νοσησάντων ἔχρην εἰρησθαι τοὺς λόγους, οὐκ ἐπὶ τῶν ἐναντίως αὐτοῖς διατηθέντων. ἀλλ' ὅμως καὶ ταῦτ' ἔγραψαν οἱ περὶ τὸν Σαβῖνον, οὐκ αἰσθανόμενοι τῆς ἐναντιολογίας... καὶ ταῦτα γράφουσιν αὐτοὶ μνημονεύσαντες ἐν

la même opinion à Hippocrate.²⁷ Dans le troisième livre, au chapitre 6, consacré à l'ἀκολασία, Stobée la cite encore sous une forme abrégée et sans doute corrompue, en l'attribuant cette fois au médecin du *Banquet* de Platon, Eryximaque.²⁸ Même Clément d'Alexandrie cite la sentence en expliquant les dommages provoqués par l'acte sexuel: il détruit et dissout les tendons, obscurcit les facultés perceptives, coupe les muscles qui se contractent, dépourvus d'énergie. Comme Pline, il cite les athlètes, mais pour montrer que ceux d'entre eux qui s'abstiennent du sexe ont plus de chance de vaincre.²⁹ Dans la suite, comme Sabinus, il attribue cette faiblesse à la perte séminale. À l'évidence, il puise lui aussi à une source médicale qui traitait des effets de l'acte sexuel. Les traces de la citation démocratéenne se perdent avant Pline, mais celui-ci ne l'a certainement pas trouvée lui-même. La doxographie médicale avait manifestement cité le fragment de Démocrite comme un témoignage de ce que l'acte sexuel est une forme d'épilepsie ou qu'il provoque des symptômes semblables. Toutefois, Démocrite parlait d'apoplexie, pas d'épilepsie. Pourtant, les deux maladies étaient souvent citées l'une à côté de l'autre comme étant deux formes d'affections qui ont leur origine dans le cerveau.³⁰ La doxographie médicale a manifestement modifié la citation démocratéenne en l'adaptant aux théories courantes sur les effets de l'acte sexuel.

τῇ τῶν προκειμένων ἐξηγήσει Δημοκρίτου τε καὶ Ἐπικούρου, μηδέπω μηδὲν ἀγαθὸν ἐξ ἀφροδισίων γενέσθαι φασκόντων. Plutarque a lui aussi puisé à une source médicale de ce genre car il fait parler dans ses *Propos de table* le médecin Zopyros sur la théorie d'Épicure concernant le même sujet, dans un langage qui semble présupposer la citation démocratéenne (Plutarch. *Quaest. conv.* 653 Dss.).

²⁷ Gell. XIX 2, 8 [527 L.] *Hippocrates autem, divina vir scientia, de coitu venerio ita existimabat partem esse quandam morbi taeterrimi, quem nostri comitalem dixerunt: namque ipsius verba haec traduntur:* τὴν συνουσίαν εἶναι μικρὰν ἐπιληψίαν.

²⁸ Stob. III 6, 44 Ἐρυξίμαχος τὴν συνουσίαν μικρὰν ἐπιληψίαν ἔλεγεν, καὶ χρόνοι μόνωι διαλλάττειν.

²⁹ Clem. Al. *Paed.* II 10, 94, 2 ἔστι γούν συνιδεῖν ἐξ αὐτῆς καθάπερ στήμονας τὰ νεῦρα διαφοροῦμένα καὶ περὶ τὴν ἐπίτασιν τῆς ὁμῆας διαρρηγνύμενα· ναὶ μὴν καὶ ἀχλὺν περισκεδάννυσσι τοῖς αἰσθητηρίοις, κόπτει δὲ καὶ τοὺς τόνους, σαφὲς τοῦτο καὶ ἐπὶ τῶν ἀλόγων ζώων καὶ ἐπὶ τῶν ἐν ἀσκήσει σωμάτων, ὧν οἱ ἀπεχόμενοι ἐν τοῖς ἀγῶσι τῶν ἀντιπάλων περιγίνονται, τὰ δὲ ἀπάγεται τῆς ὀχείας περιελκόμενα, μονονουχὶ συρόμενα, ἰσχύος ἀπάσης καὶ ὀρούσεως τέλεον κεκενωμένα. "μικρὰν ἐπιληψίαν" τὴν συνουσίαν ὁ Ἀβδηρίτης ἔλεγεν σοφιστῆς, νόσον ἀνίατον ἡγούμενος. ἡ γὰρ οὐχὶ καὶ ἐκλύσεις παρέπονται τῷ μεγέθει τῆς ἀπουσίας ἀνατιθέμεναι; "ἄνθρωπος γὰρ ἐξ ἀνθρώπου ἐκφύεται τε καὶ ἀποσπᾶται".

³⁰ L'une est une paralysie, l'autre une contraction cf. Galen. *De sympt. caus.* VII 144 αἶ τε γὰρ ἀποπληξία καὶ ἐπιληψία διὰ τὸν ἐγκέφαλον γίνονται... ibid. 151 K. ὅτι δὲ καὶ ὅλου τοῦ σώματος ἢ μὲν ἀποπληξία παράλυσις, ἢ δὲ ἐπιληψία σπασμός ἐστιν, ἔμπροσθεν εἴρηται.

On trouve chez Démocrite une *doxa* qui contraste avec la doxographie dite d'Aétius, et qui remonte probablement, elle aussi, à la tradition médicale. Il s'agit de la fameuse définition de l'*hegemonikon* que l'on trouve chez Sextus Empiricus:

Mais les uns placent la raison en dehors du corps, comme Énésidème à la suite d'Héraclite, les autres dans tout le corps, comme quelques-uns à la suite de Démocrite.³¹

Dans la doxographie qui remonte à Aétius, on lit que, selon Démocrite, l'*hegemonikon* serait dans le cerveau.³² Sextus témoigne d'une tradition différente qui remonte à ceux qui avaient pris Démocrite comme référence. On pourrait songer à Asclépiade,³³ mais Tertullien, dans un passage parallèle, attribue la même opinion au médecin Moschion, qui a vécu entre le Ier siècle avant et le Ier siècle après J.-C.

Donc tu ne dois pas penser que cet *hegemonikon* se meut au-dehors du corps comme l'affirme Héraclite, ni qu'il s'agit dans tout le corps comme le dit Moschion, ni qu'il soit enfermé dans la tête comme le dit Platon...³⁴

Tertullien remonte à Soran, qui avait sans doute ajouté les noms des médecins à ceux des philosophes. Moschion est connu pour avoir corrigé la théorie du *sphymos* (la pulsation) d'Asclépiade et comme étant l'auteur de préceptes pharmacologiques.³⁵ Il pourrait avoir réinterprété Démocrite, comme Énésidème l'avait fait avec Héraclite.³⁶ Il s'agit

³¹ Sext. Emp. *Adv. math.* VII 349 [68 A 107] ἀλλ' οἱ μὲν ἐκτὸς τοῦ σώματος [scil. εἶναι τὴν διάνοιαν], ὡς Αἰνιοσίδημος κατὰ Ἡράκλειτον, οἱ δὲ ἐν ὅλῳ τῷ σώματι, καθάπερ τινὲς κατὰ Δημόκριτον.

³² Aet. IV 5, 1 [68 A 105].

³³ Comme Mansfeld (1990) 3165.

³⁴ Tert. *De an.* XV 5 *ut neque extrinsecus agitari putes principale istud secundum Heraclitum, neque per totum corpus ventilari secundum Moschionem, neque in capite concludi secundum Platonem* ...

³⁵ Galen. *De comp. med.* XII 416, 745 K.; XIII 30 K., 537 al. K. Cf. aussi Soran. *Gyn.* II 29 [II 41, 41 Bourguière-Gourevitch]; Plin. *Nat. hist.* XIX 87. Pour les informations sur ce médecin, cf. K. Deichgräber, *RE* s. v. *Moschion*, XVI, Stuttgart, 349s.

³⁶ Mansfeld (1990) 3165 a vu dans le passage de Tertullien une 'contraction' typique de la doxographie. La *doxa* remonte selon lui à la version des *Vetusta Placita* remaniée au Ier siècle avant J.-C. Soran aurait ajouté le nom de Moschion, mais aurait sans doute nommé aussi Asclépiade, à qui les *τινές* de Sextus se réfèreraient. Le père chrétien n'aurait pas mentionné Asclépiade parce qu'il l'aurait nommé peu avant. Mais dans le passage cité par Mansfeld, Asclépiade est classé avec Dicéarque (qui apparaît aussi chez Sextus) parmi ceux qui ont nié l'existence de l'*hegemonikon* et il est opposé pour cette raison à Démocrite lui-même (XV 2 *Messenius aliqui Dicearchus, ex medicis autem Andreas et Asclepiades ita abstulerunt principale, dum in animo ipso volunt esse sensus, quorum vindicatur*

naturellement d'une interprétation de la doctrine de l'âme éparse dans tout le corps sous la forme d'atomes sphériques,³⁷ mais elle témoigne de l'intérêt porté à Démocrite dans les cercles médicaux entre le I^{er} siècle avant et le I^{er} siècle après J.-C. Peut-être ceux qui critiquaient Asclépiade cherchaient-ils un appui à leurs attaques, non seulement en montrant que celui-ci aurait suivi Démocrite en esclave, mais aussi en l'opposant à son modèle (comme le font du reste les adversaires des Épicuriens, en particulier les académiciens sceptiques).³⁸

Qu'il y ait un débat sur les doctrines médicales de Démocrite au I^{er} siècle avant J.-C., c'est aussi ce que démontre une mention faite 'en passant' par Cicéron. Il s'agit d'une polémique entre les Épicuriens et les 'Démocritéens' à propos de la persistance des sensations après la mort.

Y a-t-il donc dans le corps quelque sorte de douleur ou, en général, de sensation après la mort? Personne ne le dit, et même si Épicure attribue cette théorie à Démocrite, les Démocritéens le nient.³⁹

L'identité de ces Démocritéens demeure obscure. Cicéron y faisait encore allusion dans l'*Hortensius* et disait qu'ils n'étaient pas très nombreux.⁴⁰ On peut songer à Asclépiade et à ses disciples, mais il est possible que, dans l'atmosphère de *revival* des anciens au I^{er} siècle avant J.-C., d'autres médecins se référaient à lui.

principale... 3 sed plures et philosophi adversus Dicaearchum, Plato Strato Epicurus Democritus Empedocles Socrates...). Le passage de Chalcidius (*In Tim.* 229, 18ss. Waszink) cité par Mansfeld à l'appui de cette thèse est certainement un exemple de fusion de certaines doctrines atomistes avec celles d'Asclépiade, où Démocrite est cité en tant qu'archégète, mais il diffère du passage de Soran/Tertullien qui les met tous les deux en concurrence. Il me semble que, chez ce dernier, la *diaphonia* l'emporte sur la concordance comme c'est aussi le cas chez Sextus. Selon Polito (1994) 454 le τινές de Sextus serait une simplification que Sextus aurait faite, parce que les noms exacts des médecins ne disaient rien aux profanes.

³⁷ Dérivé des passages du *De anima* aristotélicien où il est fait référence à la doctrine démocritéenne, *De an.* 406b15 [68 A 104]; 409a32 [68 A 104a].

³⁸ Il s'agit d'une attitude bien représentée dans les écrits de Cicéron.

³⁹ Cic. *Tusc.* I 34, 82 [68 A 160] *Num igitur aliquis dolor aut omnino post mortem sensus in corpore est? nemo id quidem dicit, etsi Democritum insinuat Epicurus, Democriti negant.*

⁴⁰ Cic. *Hort.* Fr. 53 Straube-Zimmermann = 44 Grilli (*Non. De com. doctr.* 418, 13 Lindsay) *itaque tunc Democriti manus urgebatur; est enim non magna.* Ce témoignage n'apparaît ni chez Diels-Kranz ni chez Lur'e.

3 B. *Les traités médicaux sur l'hydrophobie et sur l'éléphantiasis, et la question du Pseudo-Démocrite*

Certains indices montrent qu'au I^{er} siècle après J.-C. Démocrite est connu comme un auteur qui traite de la cause et du traitement de maladies spécifiques. Il s'agit du moins, dans un cas, d'une littérature pseudo-épigraphique, mais qui renvoie très précisément l'image d'un expert des maladies et de leur traitement.

On retrouve un écho de cette réception dans les *Propos de table* de Plutarque. Dans la neuvième question [733 D], dans le contexte de l'explication générale de la manifestation des grandes pestes et maladies inhabituelles, il mentionne des démocritéens: ceux-ci affirment et écrivent que l'origine de ces maladies est souvent due au fait que des corps étrangers dérivés de la destruction d'autres mondes font irruption dans le nôtre.⁴¹

Quant à savoir qui sont ces démocritéens, ce n'est pas clair. Cette théorie n'est pas connue ou n'est pas prise en considération par Lucrèce dans son explication de l'origine des maladies dans le sixième livre du *De rerum natura* (1090ss.). S'agit-il d'Asclépiade et de ses disciples? Diels a en tout cas exclu ce témoignage de sa section sur Démocrite.

Ce *Propos* de Plutarque est pourtant intéressant, parce qu'il est étroitement lié à la question des écrits pseudo-démocritéens. La question générale dans laquelle prend place la référence aux Démocritéens est de savoir s'il est possible qu'à un certain moment se manifestent des maladies tout à fait nouvelles et inconnues jusque-là. Plutarque donne comme exemples l'hydrophobie et l'éléphantiasis. Il dit qu'un certain Athénodore, auteur d'un traité sur les Épidémies, affirme que ces maladies n'ont fait leur apparition qu'au temps d'Asclépiade.⁴²

Le nom du médecin est un indice que celui-ci, ou l'un de ses disciples, en avait traité. Ils avaient peut-être souligné le fait qu'il s'agissait de maladies inconnues auparavant et expliqué comment de nouvelles maladies peuvent se produire. La théorie des Démocritéens cités par Plutarque remonterait alors à Asclépiade ou à ses disciples. De Célius

⁴¹ Plutarch. *Quaest. conv.* p. 733 D [354 L.] τὸ μὲν οὖν ἀέρα καινὸν ἐπεισάγειν ἢ ξένον ὕδωρ ... ἐάσωμεν· καίτοι τοὺς γε Δημοκριτεῖους ἴσμεν καὶ λέγοντας καὶ γράφοντας, ὅτι [καὶ] κόσμων ἐκτὸς φθαρόντων καὶ σωμάτων ἀλλοφύλων ἐκ τῆς ἀπειρίας ἐπιρρεόντων ἐνταῦθα πολλάκις ἀρχαὶ παρεμπίπτουσιν λοιμῶν καὶ παθῶν οὐ συνηθῶν.

⁴² Plutarch. *Quaest. conv.* p. 731 A ἐγὼ δὲ καὶ μάρτυν αὐτοῖσι παρῆχον ἐκ φιλοσοφίας Ἀθηνόδωρον, ἐν τῷ προτέρῳ τῶν Ἐπιδημιῶν ἰσορροῦντα πρῶτον ἐν τοῖς κατ' Ἀσκληπιάδην χρόνοις οὐ μόνον τὴν ἐλεφαντίασιν ἀλλὰ καὶ τὸν ὑδροφοβίαν ἐκφανῆ γενέσθαι.

Aurélien, qui emprunte à Soran, il ressort que cette maladie avait été traitée en particulier par ces derniers. L'un d'entre eux est plusieurs fois cité à ce sujet. Il s'agit de Thémison, un médecin très particulier qui avait pourtant pris ses distances par rapport à son maître⁴³ et qui avait été le devancier de l'école méthodique.⁴⁴ Selon Célius/Soran, celui-ci connaissait cette maladie, mais il n'avait pas eu le temps de trouver un traitement car il y avait lui-même succombé.⁴⁵ Le premier à en avoir traité par écrit serait son disciple Eudemus,⁴⁶ le médecin qui avait été impliqué dans l'assassinat de Drusus, le fils de Tibère.⁴⁷ Célius/Soran cite aussi Artorius, un autre disciple d'Asclépiade, ainsi que les thèses d'autres Asclépiadéens qui ne sont pas nommés.⁴⁸

La question de savoir si l'hydrophobie et l'éléphantiasis ont été connues des anciens, ou s'il s'agit de maladies nouvelles et inconnues, apparaît chez deux médecins presque contemporains de Plutarque: Soran tel qu'il est repris par Célius Aurélien et, d'autre part, Rufus d'Ephèse.

Dans le Troisième livre des maladies aiguës, dans son étude de l'hydrophobie, Célius/Soran fait remonter la question de savoir s'il s'agit d'une maladie nouvelle ou ancienne aux 'logiciens', c'est-à-dire aux disciples d'Asclépiade, qui sont généralement présentés comme tels:

Quelques-uns parmi les logiciens ont posé la question de savoir si l'hydrophobie est une maladie nouvelle afin de rechercher, s'ils trouvaient qu'elle est une maladie nouvelle, une nouvelle cause et un nouveau traitement.⁴⁹

Contre ceux qui, pour démontrer la nouveauté de la maladie, donnent comme argument que personne parmi les anciens ne l'a nommée, Célius/Soran estime pour sa part qu'elle était connue des anciens. Pour justifier sa thèse, il cite, entre autres, Démocrite. Celui-ci, qui a vécu au temps d'Hippocrate, l'aurait non seulement mentionnée, mais aussi expliquée, lorsqu'il a écrit sur les sujets atteints d'opisthotonos

⁴³ Sur les relations entre Thémison et Asclépiade cf. Moog (1994) 102ss.

⁴⁴ Moog (1994) 121ss.

⁴⁵ Sur les variantes de cette histoire cf. Fr. 16–17 Moog et le commentaire relatif (156ss.).

⁴⁶ Cf. sur ce point Fr. 41–43; 45 Tecusan. Sur Eudemus cf. Wellmann (1896) 1461.

⁴⁷ Tac. *Ann.* IV 3, 4; XI 2 (Fr. 316–317 Tecusan).

⁴⁸ Cael. Aurel. *Cel. Pass.* III 11, 104; 14, 113.

⁴⁹ Cael. Aurel. *Cel. Pass.* III 15, 118: *quidam logicorum quaesiverunt pro loco, utrum nova passio sit hydrophobia, ut, si novam invenirent, novam etiam causam atque curationem inquirerent.*

(une forme de tétanos, une tension des nerfs dans la partie postérieure du corps).⁵⁰

Célius/Soran ajoute pourtant qu'Hippocrate y aurait lui aussi fait allusion, en traitant de la peur de l'eau des 'phrénétiques', ainsi qu'Homère. Il ressort de ce passage que Célius/Soran a probablement interprété des descriptions de symptômes qui pourraient correspondre à ceux de l'hydrophobie. Il apparaît, de même, que Démocrite aurait écrit sur une forme de tétanos. Toutefois, l'abdéritain est également cité au chapitre précédent, qui explique quelle partie du corps est affectée par la maladie. Selon Démocrite, là où il parle des emprosthotoniques (une autre variante de tétanos qui se manifeste comme une tension des nerfs dans la partie antérieure du corps), ce seraient les nerfs. Il le déduit (*coniciens hoc*) des contractions du corps et de l'érection. Asclépiade et ses disciples l'expliquent au contraire comme une maladie des membranes cérébrales.⁵¹ Artorius l'expliquait comme une maladie de l'estomac; d'autres disaient que le lieu affecté était l'estomac et le ventre.

Démocrite aurait même prescrit un traitement contre l'hydrophobie: une décoction d'origan très amère. Célius/Soran observe que ce traitement contredit sa définition de la maladie comme incendie des nerfs, parce que cette décoction, en provoquant un incendie dans l'estomac, aggraverait la maladie au lieu de la soigner.⁵²

Il est clair que l'on est ici confronté à la question des écrits pseudo-épigraphiques. La maladie dont traite Démocrite n'est probablement pas l'hydrophobie, mais une forme de tétanos. Le traitement n'a rien de surprenant parce que les décoctions d'origan étaient recommandées dans la pharmacopée contre les spasmes, comme cela ressort d'un

⁵⁰ Cael. Aurel. *Cel. Pass.* III 15, 119 *item [non] novam esse passionem plurimi dixerunt, sed ob astruptionem probandae novae passionis aiunt neminem veterum hanc memorasse passionem. sed soli, inquiunt, novelli inventores eandem adverterunt. [...] sed his contraria sentientes falsum esse inquiunt, quod hanc passionem nullus veterum memoraverit. etenim Democritus, non solum hanc memoravit esse passionem, sed etiam eius causam tradidit, cum de opisthotonicis scriberet.* Sur l'opisthotonos cf. [Hippocr.] *Morb.* III 13 (26, 5 Potter = VII, 132 Littré).

⁵¹ Cael. Aurel. *Cel. Pass.* III 14, 112 *vicina etiam quaestio est supradictae, quisnam in hydrophobicis locus corporis patitur. e(t) quidem Democritus, cum de emprosthotonicis diceret, nervos inquit, conciens hoc ex corporis conductione atque veretri tentigine. item Asclepiadeis sectatores alii membranam aiunt cerebri...*

⁵² Cael. Aurel. *Cel. Pass.* III 16, 132–133 *Democritus vero iubet origani decoctionem dari atque ipsum poculum, quod bibunt, in sphaerae rotunditatem formari. est autem hoc genus decoctionis acerrimum atque stomachum vexans et incendens. in quo etiam sibi repugnare perspicitur: ait enim hydrophobiam esse incendium nervorum.*

texte de Dioscoride.⁵³ Démocrite aurait-il pu, dans sa *Iétrikê gnômê*, traiter de maladies spécifiques et proposer aussi un traitement? Rien ne nous empêche de le penser,⁵⁴ étant donné que l'auteur du traité hippocratique *Du régime des maladies aiguës* déplore déjà l'invasion des profanes dans le domaine de la thérapie, invasion qui risque de menacer l'identité même du médecin professionnel. Celui-ci doit alors se distinguer de ceux-là par sa connaissance approfondie des remèdes et de la façon de les administrer. Il ne suffit pas, dit-il, de décrire exactement les symptômes de chaque maladie ou leur issue, ni d'apprendre les noms des remèdes utiles pour soigner les maladies aiguës, pour être un bon médecin: le profane peut le faire aussi. Le public pensera qu'ils disent tous deux la même chose et ne saura pas à qui se confier.⁵⁵ Cela veut dire qu'il y avait des gens qui, sans être des professionnels, connaissaient pourtant de manière théorique les maladies et leur traitement. Démocrite ne pourrait-il pas être l'un d'eux, lui aussi? Quoi qu'il en soit, une chose est certaine: entre le I^{er} siècle avant et le I^{er} siècle après J.-C., Démocrite était perçu, non seulement chez les disciples d'Asclépiade, mais aussi chez les médecins qui étaient ses adversaires, comme une autorité dans leur domaine et comme quelqu'un qui pouvait fort bien avoir écrit sur les maladies et leur traitement.

Nous disposons d'un pseudo-*épigraphon* manifeste avec l'écrit sur l'éléphantiasis. Lucrèce (VI 1014) l'avait mentionnée comme une maladie spécifique à l'Égypte. Pline l'Ancien (XXVII 7) dit la même chose, mais il ajoute qu'elle s'est manifestée à Rome au temps de Pompée et a disparu très vite. Asclépiade est actif à Rome à cette période. Célius/Soran affirme que les seuls à avoir proposé un traitement de cette maladie auraient été Thémison, le disciple d'Asclépiade, et Démocrite, le philosophe, si l'écrit sur l'éléphantiasis est bien le sien.⁵⁶

⁵³ Diosc. III 27 (II 37, 5 Wellmann) ὀρίγανος Ἡρακλεωτική [...] πρὸς δὲ τὰ σπάσματα καὶ ῥήγματα καὶ ὕδρωπας μετὰ συκίου βιβρωσκομένη. On notera aussi l'indication concernant la forme du récipient où doit être contenue la décoction. Sa forme ronde semble destinée à atténuer l'amertume de l'origan. Théophraste dit que les atomes de l'amer ont une forme anguleuse (*De sens.* 67 [68 A 135]) et il est possible qu'un récipient sphérique provoque un changement dans la disposition des ces atomes en atténuant l'amertume de la décoction.

⁵⁴ Pigeaud (1989) 118 pense à cet égard que Démocrite aurait pu s'intéresser aux spasmes et donne en exemple le Fr. 68 B 32 cité ci-dessus.

⁵⁵ [Hippocr.] *Acut.* VI 1 (38, 11 Joly = II, 238 Littré), cf. n. 10 ci-dessus.

⁵⁶ Cael. Aur. *Tard. Pass.* IV 4, 816 (Fr. 61 Moog) *veterum autem medicorum nullus istius*

Célius/Soran, alors qu'il n'a aucun doute sur la paternité de l'écrit sur l'hydrophobie, se montre dans ce cas très prudent. Rufus d'Éphèse est au contraire catégorique sur ce point: l'écrit est sans aucun doute un faux.⁵⁷ Il pourrait remonter à Bolos (s'il s'agit d'une maladie typique de l'Égypte), mais rien n'est sûr non plus dans ce cas.

On peut déjà tirer de ces observations quelques conclusions sur la réception de Démocrite dans la littérature médicale au Ier siècle après J.-C. Dans les écrits techniques au sens étroit, Démocrite n'apparaît pas comme le théoricien de l'atomisme (de cela, aucune trace n'a subsisté), mais simplement comme un auteur d'écrits techniques. Le fait que Soran n'a aucun doute sur le fait que l'étiologie d'une maladie et son traitement puissent remonter à Démocrite, s'il ne nous dit rien sur la paternité de l'écrit, nous montre malgré tout qu'il prenait au sérieux les théories médicales démocritéennes bien plus que ne le font les interprètes modernes. Toutefois, Soran n'est pas le premier à tenir Démocrite pour un technicien. Avant lui, il y eut certainement un groupe de médecins, probablement des disciples et aussi des adversaires d'Asclépiade, qui l'avaient pris comme référence. C'est un fait qu'on ne doit pas négliger quand on est tenté d'interpréter Démocrite dans une perspective unilatérale.

4. *Démocrite dans les Geoponica: les prévisions et l'hydrosophie (Geop. I 12 et II 6).*

4 A. *Remarques générales sur la transmission à l'intérieur de la littérature technique*

La même image d'un écrivain technique au sens étroit apparaît dans la littérature *de re rustica*. Dans ce domaine aussi, Oder et Wellmann ont laissé un désert: tout ce qui concerne l'agriculture viendrait de Bolos. L'attribution du *Περὶ γεωργίας* à ce dernier est en réalité le résultat des acrobaties philologiques de Wellmann.⁵⁸ Naturellement, il est dans certains cas extrêmement difficile de distinguer ce qui est original de

passionis curationem ordinavit excepto Themisone atque ex philosophis Democrito, si vere eius de elephantiacis conscriptus dicitur liber.

⁵⁷ Ruf. Eph. *ap.* Oreib. *Coll. med.* XLV 28, ἰ μόνος ἡμῖν Στράτων ὁ τοῦ Ἑρασιστράτου μαθητῆς ἐννοίας παρέσχε τοῦ πάθους, κακοχυμίαν αὐτὸ ὀνομάζων· τὸ γὰρ εἰς Δημόκριτον ἀναφερόμενον βιβλίον περὶ τοῦ νοσήματος φανερώς κατέψευσται.

⁵⁸ Voir la critique de Kroll (1934) 230.

ce qui ne l'est pas, mais cela ne veut pas dire que rien ne remonte à Démocrite. Comme on l'a déjà dit, ce qui est à l'origine du refus, c'est le préjugé selon lequel il serait seulement un philosophe et le fait qu'il ne parle pas dans ces passages d'atomes ou de vide, mais simplement de procédés techniques.

En outre, comme on l'a souvent remarqué, s'il n'y avait pas eu chez Démocrite quelque point auquel se rattacher, Bolos ne l'aurait pas choisi comme autorité de référence. Toutefois Bolos n'est pas nécessairement la seule source de la transmission démocritéenne dans le domaine de l'agriculture. En tout cas, deux chapitres des *Geoponica* (I 12 et II 6), comme l'avait vu Oder lui-même, ne sont pas directement tirés de Bolos, mais ajoutés par Cassianus Bassus (VI^e siècle après J.-C.), un auteur d'agriculture auquel remonte la compilation byzantine. À cet égard, il convient de faire quelques observations générales sur la transmission dans la littérature technique, qui peuvent éclairer au moins les procédés de Bolos et de la littérature pseudo-démocritéenne.

La littérature technique se fonde en premier lieu sur l'utilisation, la mise à jour et aussi le remaniement du matériau préexistant. C'est tout à fait évident, par exemple, dans les traités hippocratiques: parfois, on copie presque tout, comme c'est le cas pour des passages du traité *Sur la nature de la femme* qui reprennent sans ou avec peu de variantes des passages des livres *Sur les maladies des femmes*.⁵⁹ Parfois, on réécrit sous une autre perspective des chapitres entiers, comme c'est le cas pour l'écrit *Sur les maladies II*: les onze premiers chapitres étudient les mêmes maladies que celles qui sont examinées dans les chapitres suivants du point de vue de leur étiologie, perspective qui leur manquait tout à fait.⁶⁰ Parfois encore, il y a un fort remaniement, comme dans les traités gynécologiques où Grensemann a distingué plusieurs couches.⁶¹

Face à cette situation d'extrême 'fluidité',⁶² on ne peut jamais être sûr que ce qu'on trouve dans la littérature pseudo-démocritéenne ne contient pas quelque chose du noyau original ou ne reproduit pas

⁵⁹ Cf. Grensemann (1987).

⁶⁰ Sur ce point, cf. Jouanna (1974) chap. II.

⁶¹ Cf. Grensemann (1975) 80ss.; (1982).

⁶² Sur cet aspect des traités gynécologiques et des traités médicaux rédigés sous forme de catalogue cf. aussi Hanson (1997). Sur le caractère 'provisoire' de la littérature technique en général cf. aussi Heinimann (1961) 109 n. 19.

l'original lui-même. Cela ne veut naturellement pas dire qu'on n'ait aucun critère pour identifier approximativement ce qui peut remonter à Bolos ou à quelqu'un d'autre, et ce qui peut remonter à Démocrite.

En effet, si l'on prend les *Geoponica*, l'écrit dont je voudrais maintenant parler, on voit qu'il y a des groupes de témoignages sur Démocrite qui sont identifiables comme tels, aussi bien par leur contenu que par leur forme.

Nous avons là:

1. Des prévisions générales sur le temps, les événements, les maladies et l'agriculture, sur la base de la position de Zeus dans les différents signes zodiacaux. Il s'agit d'un groupe compact, limité au chap. 12 du premier livre et lemmatisé sous le nom de Zoroastre. Oder pensait qu'il s'agissait d'une insertion de Cassianus Bassus.
2. Une section très intéressante sur l'hydrosophie (II 6).
3. Des conseils généraux sur l'agriculture.
4. Des préceptes pour soigner les hommes, les plantes et les animaux avec le dosage correspondant.
5. Des préceptes 'magiques' du type des *theriaka* ou *alexipharmaca* ou basés sur le principe de la sympathie et de l'antipathie.

On peut être presque sûr que ce dernier groupe remonte à Bolos, de même, probablement, que les préceptes avec dosage précis, une caractéristique typique des écrits médicaux à partir de l'époque hellénistique. Nous n'avons pas la *Pharmakitis* hippocratique, mais, dans les traités dans lesquels des préceptes sont donnés comme, par exemple, les traités gynécologiques et le traité *Sur les affections internes*, le dosage n'est presque jamais spécifié. Le troisième groupe doit être évalué au cas par cas. Le premier et le second type peuvent au contraire, à mon avis, contenir des éléments démocritéens originaux. C'est sur ces points que je voudrais faire quelques observations.

4 B. *Les prévisions* (Geop. I 12)

David Sider (2002) a déjà attiré l'attention sur le fait que ce chapitre ne contient rien qui ne puisse être également rapporté au Démocrite historique. Il est presque isolé et très spécifique et il contient des prévisions qui n'ont rien d'exceptionnel. Je voudrais faire quelques remarques supplémentaires à l'appui de cette thèse.

Je me contenterai ici de citer quelques passages:

I 12, 5 (Zeus se trouve dans la constellation du bélier. L'auteur a déjà décrit quel sera le temps de l'année et quelles maladies se développeront):

Démocrite dit que le vin est bon et se conserve bien, que cette année n'est favorable que pour planter de la vigne. On doit mettre à l'abri le froment qui se trouve sur les aires à cause des pluies; les oiseaux sont rares; il convient aussi d'apprêter des potagers.⁶³

I 12, 17 (Zeus se trouve dans la constellation des jumeaux):

Démocrite dit qu'il y a des dommages provoqués par la grêle. Il faut prier pour qu'il n'y ait pas de maladies pestilentielles.⁶⁴

I 12, 19 (Zeus se trouve dans la constellation de l'écrevisse):

Démocrite dit qu'à l'automne il y a des eczémas autour de la bouche, et c'est pour cela qu'au printemps, on doit manger des légumes et purger le ventre et que les jeunes gens surtout doivent boire du vin pur. L'olivier portera beaucoup de fruits.⁶⁵

I 12, 30 (Zeus se trouve dans la constellation du scorpion):

Démocrite dit que les fleuves seront pleins et qu'il y aura des maladies à l'automne. À cause de cela, on doit prier pour qu'il n'y ait pas de maladies pestilentielles. Il faut prendre peu de nourriture, mais boire plus.⁶⁶

Comme on le voit dans ces exemples, on est ici dans le domaine des prévisions typiques, soit de la littérature médicale contemporaine de Démocrite (les aphorismes hippocratiques et les livres des *Épidémies*, surtout le premier et le troisième, sont sur ce point très significatifs), soit du genre de prévisions météorologiques qu'on retrouve aussi dans le calendrier démocritéen du Fr. 68 B 14.⁶⁷ Il n'y aurait rien d'étrange à ce que ces observations remontent à Démocrite.

⁶³ ὁ δὲ Δημόκριτος λέγει, τὸν οἶνον χρηστὸν καὶ παράμονον εἶναι, εὖθετον δὲ εἶναι τὸ ἔτος πρὸς μόνην ἀμπέλων φντεῖαν. ἀσφαλίζεσθαι δὲ δεῖ τὸν σῖτον ἐν ταῖς ἄλωσι διὰ τοὺς ὀμβροῦς γενέσθαι δὲ ὀρνέων σπάνιν, καλὸν δὲ καὶ κήπους κατασκευάζειν.

⁶⁴ Δημόκριτος δὲ φησι, χαλάζης γίνεσθαι βλάβην. εὖχεσθαι δὲ δεῖ, ἵνα μὴ λοιμικὰ πάθη γένηται.

⁶⁵ Δημόκριτος δὲ φησιν, ἐν τῷ φθινοπώρῳ ἐκζέματα γίνεσθαι περὶ τὰ στόματα, διὸ χρὴ πρὸς τὸ ἔαρ λαγάνων ἄπτεσθαι, κοιλίαν τε λύνειν, καὶ μάλιστα τοὺς νέους, ἀκράτῳ δὲ χρῆσθαι. ἡ δὲ ἐλαία εὐφορήσει.

⁶⁶ Δημόκριτος δὲ φησι, ποταμοὺς μεγάλους ἔσεσθαι, καὶ νόσους περὶ τὸ φθινοπώρον. διὸ εὖχεσθαι δεῖ, ἵνα μὴ λοιμικὰ γένηται πάθη. χρὴ, φησί, βρώμασι μὲν ὀλίγοις, ποτῶι δὲ πλείονι χρῆσθαι.

⁶⁷ Cf. e.g. [68 B 14, 3] (Gemin. *Isag.* 101, 25 Aujac) (Scorpion) ἐν δὲ τῇ δ' ἡμέρᾳ Δημοκρίτῳ Πλειάδες δύνουσιν ἅμα ἡοῖ· ἄνεμοι χειμέριοι ὥς τὰ πολλά, καὶ ψύχη, ἥδη

Ce chapitre présente une singularité que l'on ne rencontre nulle part ailleurs dans les *Geoponica* et qui peut faire penser au Démocrite original: la répétition de l'expression particulière εὔχεσθαι δεῖ, à cinq reprises dans les paragraphes qui concernent les prévisions attribuées à Démocrite; à quatre reprises dans les autres (10; 17; 30; 37; 40-44; 22; 26; 34). La même expression se rencontre dans tous les témoignages sur les idoles démocritéennes.⁶⁸

4 C. *L'hydrosophie* (Geop. II 6)

Un autre passage très intéressant concerne l'hydrosophie décrite au sixième chapitre du deuxième livre des *Geoponica*. Il s'agit là d'une technique très ancienne, comme l'avait bien démontré E. Oder (1899) dans l'étude la plus complète sur ce thème et en particulier sur l'Hydrosopie de Démocrite. Le verbe technique ancien n'est pas ὑδροσκοπέω,⁶⁹ mais φρεωνρχέω avec le substantif φρεωνρχος. On le trouve dans un sens métaphorique chez Aristophane (*Lys.* 1033). Une comédie d'un contemporain d'Aristophane, Philyllios s'appelait *Phreôrychos* (Fr. 17-18 K.-A.). Ce titre montre que cette technique était très populaire dès le dernier quart du Ve siècle avant J.-C. Oder, dans l'étude mentionnée ci-dessus, a essayé de démontrer non seulement que la lemmatisation était une invention du compilateur byzantin, mais aussi qu'il n'y avait pas de traces d'une théorie démocritéenne pour deux raisons:

1. parce que des excursus parallèles sur les présupposés théoriques et sur les techniques de l'hydrosophie se trouvent chez d'autres auteurs, surtout Vitruve dans le livre VIII, chap. 1, et Sénèque dans le livre III des *Quaestiones Naturales* sur les eaux. Tous les deux remonteraient à Posidonius par l'intermédiaire de disciples différents.

καὶ πᾶσιν, ἐπιπνεῖν φύλει· φυλλοορροεῖν ἄρχεται τὰ δένδρα μάλιστα. (Gemin. *Isag.* 103, 12 Aujac) (sagittaire) ἐν δὲ τῇ τε Δημοκρίτῳ Ἀετὸς ἐπιτέλλει ἅμα ἡλίῳ καὶ ἐπισημαίνει φύλει βροντῇ καὶ ἀστραπῇ καὶ ὕδατι ἢ ἀνέμοι ἢ ἀμφοτέρω ὡς ἐπὶ τὰ πολλὰ.

⁶⁸ Sext. Emp. *Adv. math.* IX 19 [68 B 166] Δημοκρίτος δὲ εἰδωλὰ τινὰ φησιν ἐμπελάζειν τοῖς ἀνθρώποις, καὶ τούτων τὰ μὲν εἶναι ἀγαθοποιὰ, τὰ δὲ κακοποιὰ (ἐνθεν καὶ εὔχετο εὐλόγων τυχεῖν εἰδώλων)... Voir aussi Plutarch. *Aem. proem.* 4 [472a L.] Δημοκρίτος μὲν γὰρ εὔχεσθαι φησι δεῖν ὅπως εὐλόγων εἰδώλων τυγχάνωμεν καὶ τὰ σύμφυλα καὶ χρηστὰ μᾶλλον ἡμῖν ἐκ τοῦ περιέχοντος ἢ τὰ φαῦλα καὶ σκαιὰ συμφέρεται. *De def. orac.* p. 419 A.

⁶⁹ Ni les substantifs ὑδροφαντική, ὑδροφάντης ou ὑδρομαστευτική, les autres termes techniques qu'on trouve au début du chapitre des *Geoponica*. Le premier est utilisé

2. parce que Démocrite aurait soutenu la thèse que toutes les eaux de la mer et des fleuves dériveraient du ‘Weltmeer’, du fleuve Océan. Aucun des témoignages sur Démocrite ne nous le dit, bien sûr, mais Oder le déduisait de la description des tremblements de terre, dans laquelle on lit que les parties desséchées de la terre attirent à elles l’eau des parties humides. C’était selon lui la même théorie que celle de Diogène d’Apollonie, auquel à son tour Oder avait attribué la théorie du ‘Weltmeer’. La conclusion de Oder était que, dans le passage des *Geoponica*, il n’y a aucune théorie semblable, *ergo* on ne peut rien attribuer à Démocrite.

En ce qui concerne les sources, on doit dire avant tout que nous ne trouvons pas chez Sénèque une étude de l’hydroscopie, mais une étude des eaux en général. On trouve certainement ici des théories semblables à celles des *Geoponica*, mais le contexte est tout à fait différent. Vitruve constitue un cas plus particulier.⁷⁰ Il traite explicitement de l’hydroscopie dans le Premier chapitre du huitième livre, qui présente avec notre passage des ressemblances très étroites mais aussi des différences significatives. Dans les *Geoponica* eux-mêmes, on trouve, tout de suite avant le Sixième chapitre, deux chapitres sur l’hydroscopie lemmatisés sous des noms différents: ‘Υδροσκοπικόν. Παξάμου (II 4) et Ἄλλο περὶ ὑδροσκοπίας (II 5). Le premier donne des renseignements sur la manière de repérer les endroits où il y a de l’eau (observation des plantes qui y poussent, expériences différentes). Le deuxième est plus complet et ressemble par sa structure au développement de Vitruve bien plus que le sixième chapitre, qui est le développement le plus complet sur l’hydroscopie dans l’Antiquité. Comme on l’a déjà dit, la transmission à l’intérieur de la littérature technique est complexe et stratifiée et il est difficile de croire que tous ces textes remontent à une seule et même source, bien qu’ils traitent de thèmes semblables, comme on peut s’y attendre pour des traités techniques. Même en admettant que les informations sur l’hydroscopie des *Geoponica* remontent à une seule source, Posidonius selon Oder, Théophraste selon Steinmetz,⁷¹

seulement par Olympiodore (*In Meteor.* 99, 21; 127, 28), tandis que ὑδρομαστευτική ne se rencontre qu’ici.

⁷⁰ Sur le rapport de Vitruve à Démocrite, voir Morel (2003).

⁷¹ (1964) 221–242. Selon Steinmetz, aussi bien Vitruve que la source des *Geoponica* remonteraient, avec des médiations, à Théophraste. La disposition du chapitre II 6 et les théories qui y sont représentées seraient caractéristiques de celui-ci.

cela n'exclut pas que l'un ou l'autre aient repris et exposé des théories démocritéennes, comme ils en avaient l'habitude.⁷²

Si, comme Oder lui-même le reconnaissait, la pratique de l'hydrosophie est très ancienne, on doit penser que ce qui relève de l'observation du terrain, des plantes qui y poussent, du goût de l'eau que l'on y trouve et des moyens de la trouver devait aussi faire partie, d'une manière ou d'une autre, de la technique originaire. En tout cas, Théophraste, Posidonius ou quelqu'un d'autre doivent avoir utilisé des sources plus anciennes. Oder était remonté jusqu'à l'écrit hippocratique *Sur les Aires les eaux et les lieux*.⁷³ Il ne mentionne jamais la possibilité qu'on ait aussi utilisé un matériau démocritéen, parce qu'il l'avait exclue en vertu de son hypothèse selon laquelle Démocrite avait fait dériver les eaux terrestres de l'océan. Or cette hypothèse est complètement dépourvue de fondements. À en juger par les témoignages sur le tremblement de terre, il semble au contraire que Démocrite, comme Anaxagore, supposait l'existence de réservoirs d'eaux souterrains, alimentés également par l'eau de pluie. Les tremblements de terre se produisent lorsque ces réservoirs ne peuvent plus accueillir l'excédent d'eau de pluie ou lorsque, à la suite de la sécheresse de la terre, l'eau d'un réservoir s'écoule dans une autre cavité, elle-même vide d'eau.⁷⁴

Ainsi, non seulement les déductions de Oder sont arbitraires, mais ses doutes sur le lemme ne sont pas justifiés. En effet, dans les scholies à Basilius, qu'Oder ne pouvait pas connaître parce qu'elles n'ont été publiées qu'en 1910 par Pasquali, l'œuvre de Démocrite est nommée, soit sous le titre Ὑδροσκοπικά soit, et en premier lieu, sous le titre

⁷² Pour Théophraste cf. e.g. *De caus. plant.* I 18, 2; II 11, 7 [68 A 162]; Hibeh Papyr. 16, p. 62 Grenfell–Hunt [68 A 99a]. Pour Posidonius, Sen. *Quaest. nat.* VII 3, 2 [68 A 92]; Sen. *Quaest. nat.* V 2 [68 A 93a]; VI 20, 1 [68 A 98]; VII 12, 1.

⁷³ Oder (1890) 306ss. Il rapporte à cet écrit la théorie de la douceur des eaux de pluies et la théorie selon laquelle les eaux prennent le goût des terrains qu'elles traversent. Toutefois, à propos de la dernière thèse, Aristote (*De sens.* 441b1) parle explicitement des anciens philosophes de la nature (πολλοὶ ... τῶν ἀρχαίων φυσιολόγων), et non des médecins, et Théophraste (*De caus. plant.* VI 3, 1) des 'anciens', c'est-à-dire des mêmes savants (διὸ καὶ οἱ παλαιοὶ φασιν (scil. ὕδωρ) δι' οἷας ἂν γῆς ῥέη, τοιοῦτο καὶ εἶναι).

⁷⁴ Arist. *Meteor.* 365a14 [68 A 97] Δημόκριτος δὲ φησι πλήρη τὴν γῆν ὕδατος οὔσαν καὶ πολὺν δεχομένην ἕτερον ὁμβρίων ὕδωρ ὑπὸ τούτου κινεῖσθαι· πλείονός τε γὰρ γινομένου διὰ τὸ μὴ δύνασθαι δέχεσθαι τὰς κοιλίας ἀποβιαζόμενον ποιεῖν τὸν σεισμόν, καὶ ξηρανομένην καὶ ἔλκουσαν εἰς τοὺς κενοὺς τόπους ἐκ τῶν πληρεστέων τὸ μεταβάλλον ἐμπίπτον κινεῖν.

Φρεωρυχικά.⁷⁵ On a ici un titre qui est sûrement plus ancien que celui des *Geoponica* et qui pourrait remonter assez haut, comme on l'a vu pour le titre de la comédie de Philyllios. Oder affirmait que ce chapitre n'avait rien à faire avec l'agriculture, mais cela n'est pas vrai, parce que la présence de l'eau dans un terrain est fondamentale pour l'agriculteur. Étant donné que Vitruve traite de l'hydrosophie dans un traité sur l'architecture, on peut imaginer que Démocrite pouvait avoir traité du même sujet dans son ouvrage sur l'agriculture.

Steinmetz, à l'évidence influencé par Oder, laisse complètement de côté la question de l'attribution de ce chapitre à Démocrite. La question de la stratification de ce texte est sans doute très complexe, mais il y a, en particulier dans la première partie de celui-ci, des éléments qui pourraient bien remonter à Démocrite. Je ne ferai ici que signaler quelques points.

L'auteur affirme que ceux qui s'occupent de l'hydrosophie font avant tout des considérations générales: les montagnes contiennent de l'eau douce tant que les cours d'eau ne passent pas dans des terrains salés ou bien contenant du nitre, de l'alun ou du soufre (on sait que Démocrite connaissait ces types de terrain parce qu'il y avait fait allusion en parlant de la formation de la mer).⁷⁶ Les plaines n'ont pas d'eau et, si elles en ont, il s'agit d'eau salée. L'auteur continue en expliquant les causes de ce phénomène:

Geop. II 6, 3. Ils ajoutent à ce qu'on a dit les causes physiques suivantes, c'est-à-dire que le soleil tire toujours des eaux la partie la plus subtile et la plus légère. En ce qui concerne les plaines, le soleil qui, pendant toute la journée, les occupe, en exprime l'humidité et la fait s'évaporer. À cause de cela, les unes sont absolument dépourvues d'eau, dans celles où il reste un peu d'eau, on trouve que celle-ci est tout à fait salée, parce que sa partie légère et douce a été consommée comme cela s'est aussi passé pour la mer.⁷⁷

Ce passage est remarquable pour deux raisons:

⁷⁵ Schol Basil. 21 [68 B 300,8] ἔστιν Δημοκρίτου πραγματεία τὰ Φρεωρυχικά, καὶ ἄλλοι ἔγραψαν Ὑδροσκοπικά.

⁷⁶ Hibeh Papyr. 16, p. 62 Grenfell-Hunt col. 1. [68 A 99a]. Cf. aussi Theophr. *De caus. plant.* VI 3, 1, ci-dessus, n. 72.

⁷⁷ φυσικὰς δὲ τοῖς εἰρημένοις αἰτίας τοιάσδε προσάπτουσιν, ἀπὸ τῶν ὑδάτων τὸ λεπτομερέστατον αἶι καὶ ἐλαφρότατον ἔλκειν τὸν ἥλιον. τὰ μὲν οὖν πεδία δι' ὅλης ἐπέχοντα τῆς ἡμέρας τὸν ἥλιον ἐξαμέλγειν τὸ ὑγρὸν καὶ ἐξατμίζειν, ὅθεν τὰ μὲν τελέως ἀνυδρα ὑπάρχει, ἐν οἷς δὲ καταλείπεται τινα τῶν ὑδάτων, ἀλμυρὰ εὐρίσκεται πάντως, τοῦ ἐλαφροῦ καὶ γλυκεοῦ ἐξ αὐτῶν ἀναλίσκομένου, καθάπερ καὶ τὴν θάλασσαν συμβέβηκε.

1. En premier lieu pour la langue archaïsante. Le verbe ἐξαμέλγειν est un terme très rare, attesté seulement deux fois chez des auteurs du Ve siècle avant J.-C..⁷⁸ Les lexiques les considèrent comme une glose.⁷⁹
2. En deuxième lieu parce que, dans le texte parallèle de Vitruve cité par Oder et repris par Steinmetz, on a une théorie de l'évaporation semblable, surtout, à celle des Hippocratiques et de Théophraste mais pas à celle de Démocrite. On souligne dans ce texte que l'humidité que le soleil a fait s'évaporer est enlevée par l'air et dispersée dans le ciel:

Vitruv. VIII 1, 7. Dans les plaines en revanche elles ne peuvent pas être abondantes. Et les eaux que l'on trouve ici ne peuvent pas être saines, parce que, en l'absence d'ombre, la véhémence du soleil enlève, en la drainant avec sa chaleur, l'humidité des champs qui se trouvent dans la plaine et si quelques eaux sont visibles, l'air, en attirant d'elles la part la plus légère, la plus subtile et la plus saine, la disperse dans le ciel. Dans les sources de plaine ne restent alors que les parties les plus lourdes, dures et désagréables de l'eau.⁸⁰

Ce texte suppose la théorie de la formation de la pluie que l'on trouve dans le chapitre suivant (VIII 2, 1): l'humidité évaporée sous l'action du soleil est transportée par l'air jusqu'à une certaine hauteur, où elle se condense et retombe sur la terre sous forme de pluie.

La doctrine selon laquelle le soleil provoque l'évaporation de l'eau terrestre est répandue au Ve siècle avant J.-C., mais elle existe sous deux formes différentes: selon les uns (Héraclite, Hérodote, Diogène d'Apollonie, l'auteur du traité hippocratique *Sur les vents*, Démocrite), la partie la plus subtile et la plus douce des eaux terrestres arrive jusqu'au soleil, qui s'en nourrit. Selon les autres (l'auteur du traité hippocratique *Sur les airs, les eaux et les lieux*), le soleil est seulement la cause qui déclenche le phénomène, mais cette partie de l'eau n'arrive pas jusqu'à lui; entraînée par les vents, elle se transforme en pluie.⁸¹ Démocrite

⁷⁸ Aesch. *Cho.* 896–898 ἐπίσχεξ, ὃ παῖ, τόνδε δ' αἰδεσαι, τέκνον,/ μαστόν, πρὸς οἷ σὺ πολλὰ δὴ βροίζων ἄμαι/ οὐλοισιν ἐξήμελξας εὐτραφὲς γάλα. Comparer Eur. *Cycl.* 209.

⁷⁹ Erotian *Voc. Hipp.* 70, 11 Klein ἐξαμελγόμενα· ἐκθηλαζόμενα. Il s'agit là d'une variante de ἐξαθελγόμενα chez [Hippocr.] *Nat. oss.* XIX 1 (158, 8 Duminil = IX 196 Littré).

⁸⁰ *campestribus autem locis contrario non possunt (scil. aquae) habere copias. nam quaecumque sunt, non possunt habere salubritatem, quod solis vehemens impetus propter nullam obstantiam umbrarum eripit exhauriendo fervens ex planitie camporum humorem, et si quae sunt aquae apparentes, ex his quod est levissimum tenuissimumque et subtili salubritate aer avocans dissipat in impetum coeli. quaeque gravissimae duraeque et insuaves sunt partes, eae in fontibus campestris relinquuntur.*

⁸¹ Hippocr. *De aëre aqu. loc.* VIII 2 (204, 12 Jouanna = II, 32 Littré). Sur la coexistence

avait soutenu la première théorie et il y avait vu une cause du fait que la mer finirait par disparaître totalement avec le temps.⁸² La comparaison avec la mer dans les *Geoponica* est, à ce propos, très significative parce qu'elle manque, aussi bien chez Vitruve que chez Sénèque. La raison en est qu'elle se rattache directement à la théorie du soleil qui se nourrit de l'eau terrestre; si la mer, selon Démocrite, doit finir par disparaître, c'est évidemment parce que le soleil ne restitue jamais sous forme de pluie l'eau qu'il extrait.⁸³ Nous trouvons donc dans les *Geoponica* une théorie exactement contraire à celle de Vitruve. Si l'on veut garder Théophraste comme source première, on doit admettre qu'il avait cité les deux théories, celle du traité hippocratique et celle de Démocrite. L'une aurait été reprise par la source de Vitruve, l'autre par celle des *Geoponica*.

On peut faire une autre observation à propos des paragraphes 11 et 12, qui traitent des veines d'eau souterraines. Dans les *Geoponica*, on trouve une comparaison entre les veines d'eau souterraines et les veines du corps humain: de même que celui-ci est traversé de veines et d'artères, les unes pleines de sang les autres d'air, de même y a-t-il dans la terre des lieux poreux pleins d'air et des veines d'eau qui s'entrelacent. Comme l'avait déjà remarqué Oder, la distinction entre veines et artères remonte tout au plus à la deuxième moitié du IV^e siècle avant J.-C., au moment de sa découverte par Praxagore de Cos. De plus, la conception du monde comme être vivant est typiquement stoïcienne. Oder citait à ce propos le passage parallèle de Sénèque⁸⁴ (il n'y a rien de semblable chez Vitruve) comme preuve que cette comparaison remonte aussi à Posidonius. Reinhardt a contesté que Posidonius soit à l'origine de cette comparaison des *Geoponica* entre la terre et le corps,⁸⁵ et il l'a

des deux théories dans le dernier tiers du Ve siècle avant J.-C. Cf. Gemelli Marciano 1993.

⁸² Aristot. *Meteor.* 356b10 [68 A 100] τὸ δὲ νομίζειν ἐλάττω τε γίγνεσθαι τὸ πλήθος (scil. ἡ θάλαττα), ὥσπερ φηοὶ Δημόκριτος, καὶ τέλος ὑπολείφειν, τῶν Αἰσώπου μύθων οὐδὲν διαφέρειν ἔοικεν ὁ πεπεισμένος οὕτως. Cf. Alex. Aphr. *In Meteor.* 78.12 [409 L.].

⁸³ Eustath. *In Od.* μ 65, 1713, 9 [68 B 25] ἄλλοι δὲ Δία μὲν νοοῦσι τὸν ἥλιον ἀκολούθως Πλάτωνι, ὃς ἐν Φαίδρωι φησὶν Ὁ μὲν δὴ μέγας ἐν οὐρανῷ Ζεὺς, ὃ ἐστὶν ἥλιος, πτηνὸν ἄρμα ἐλαύνων· ἀμβροσίαν δὲ τὰς ἀτμίδας αἷς ὁ ἥλιος τρέφεται, καθὰ δοξάζει καὶ Δημόκριτος. Même si l'interprétation homérique ne remonte pas à Démocrite, la théorie selon laquelle le soleil se nourrit des exhalaisons de la mer est la sienne. Cf. la discussion de ce passage chez Gemelli Marciano (1993) 253–255.

⁸⁴ *Quaest. nat.* III 15, 1.

⁸⁵ RE s. v. Poseidonios, XXII, 1, 1953, 682–683. Il fait remarquer que dans les

comprise comme une interpolation de l'auteur-source, qui aurait ajouté ses connaissances de provenance stoïcienne sur l'animal terrestre, là où on parlait de simples sources. Si l'on tient compte de ce qu'on a dit sur les caractéristiques de la littérature technique, on doit parler de mise à jour de théories plus anciennes plutôt que d'interpolation. En effet, si la distinction précise entre veines et artères ne peut remonter au-delà du IV^e siècle avant J.-C., la théorie de l'homme comme microcosme est déjà attestée chez Démocrite [68 B 34]. Mais, élément encore plus significatif, les lexiques témoignent que Démocrite avait institué une analogie entre les réceptacles d'eaux et les veines, en désignant celles-ci par le nom δεξαμεναί:

[68 B 135] Hesych s. v. δεξαμεναί: réceptacles d'eau et, dans le corps, les veines. De Démocrite.⁸⁶

Sénèque précise, dans le passage cité par Oder et d'autres, que la dénomination de veines pour les eaux remonte aux *maiores nostri*⁸⁷ c'est-à-dire en grec à οἱ παλαιοί. Naturellement, il s'agit d'une allusion très générale, mais elle montre que cette comparaison remonte bien plus haut, si l'on considère que, chez Théophraste, l'expression οἱ παλαιοί désigne très souvent les présocratiques.⁸⁸ À ce propos, on peut observer que, si l'on en croit le témoignage d'une version arabe du commentaire d'Olympiodore aux *Météorologiques* d'Aristote, Démocrite avait fait d'autres comparaisons entre les phénomènes qui se produisent dans le corps et ceux qui se produisent dans la terre. Les tremblements de terre se produiraient par exemple, non seulement lorsque, à la suite de pluies abondantes, les cavités de la terre se remplissent d'eau au-delà de ce qu'elles peuvent contenir, mais aussi lorsque, à cause de la sécheresse, l'eau qui se trouve dans ces cavités est extraite de la terre sèche. Le tremblement est dans ce cas produit par le mouvement de l'eau depuis

parallèles sur l'hydrosophie cités par Oder, il n'apparaît rien de semblable. Il est aussi de l'opinion que: 'Das von Oder so hochgeschätzte Hydroskopikon dürfte mit Poseidonios nichts zu tun haben. Schon die Sprache, die mich umständlich und altertümlich dünkt [...], spricht dagegen.'

⁸⁶ δεξαμεναί: ὑδάτων δοχεῖα, καὶ ἐν τῷ σώματι φλέβες. Δημοκρίτου.

⁸⁷ Sen. *Quaest. nat.* III 15, 1 *in terra quoque sunt alia itinera per quae aqua, alia per quae spiritus currit; adeoque ad similitudinem illa humanorum corporum natura formavit ut maiores quoque nostri aquarum appellaverint venas.* Dans ce passage également, on peut distinguer deux couches: les théories les plus anciennes, qui parlent seulement des veines d'eaux, et la version plus moderne qui parle de veines et d'artères.

⁸⁸ Theophr. *De caus. plant.* VI 3, 1 (ci-dessus, n. 72); VI 3, 5; *De sens.* 58.

les cavités vers le bas, en direction de la terre. Il s'agirait d'un phénomène semblable aux frissonnements qui se produisent dans le corps lorsque la vessie, après avoir été vidée, se remplit à nouveau de fluides chauds.⁸⁹ On ne peut donc pas exclure que la comparaison entre veines du corps et veines d'eau remonte à Démocrite, et que, dans les *Geoponica*, nous ayons affaire à une adaptation de cette thèse aux théories plus modernes.

Si l'on en vient à la dernière partie du développement des *Geoponica*, on trouve la description d'une expérience permettant de déterminer s'il y a de l'eau dans un terrain: on prend un vase de plomb, on l'oint d'huile et on dispose de la laine à l'intérieur. On fait un creux dans la terre et on y met le vase renversé. On couvre le tout avec des feuilles et on le laisse là une nuit. Le lendemain, on enlève le vase et, s'il y a de l'humidité à l'intérieur du vase et si la laine est imbibée d'eau, on peut être sûr qu'il y a de l'eau. Si l'on en goûte, on peut aussi établir quel genre d'eau se trouve dans ce terrain. Les techniciens connaissaient sans doute beaucoup d'expériences de ce genre. On en trouve de semblables au quatrième chapitre des *Geoponica* sous le nom de Paxamos; au cinquième chapitre, il y en a une autre, différente; Vitruve en rapporte plusieurs, avec des vases et d'autres objets; Olympiodore, dans son commentaire aux *Météorologiques* d'Aristote en rapporte une autre.⁹⁰ Ces techniques ont peut-être été mises à jour, mais la plupart devaient faire partie de l'art des temps anciens. Les expériences avec les vases n'étaient du reste pas inconnues de Démocrite lui-même. Le fameux expédient du soi-disant vase de cire pour distiller de l'eau douce à par-

⁸⁹ Olympiod. *Meteor.* Commentaire sur Aristote perdu en grec et autres épîtres, éd. par A. Badawi, Beirut 1971, S. 133f. (Traduction de l'arabe par G. Strohmaier 1998, 363) Die Ansicht Demokrits ist die, dass er sagt: 'In der Erde sind gefüllte Wasserläufe, und wenn aus diesem Grunde in die Wasserläufe aus den Quellen zur Zeit des Regens viel andere Gewässer eindringen und mehr als sie fassen können, wenden sich diese Gewässer zurück und bedrängen sich gegenseitig auf eine Weise, dass es die Erde erschüttert, so wie die Mostkrüge platzen und zerbrechen, wenn sie mehr als zulässig gefüllt werden, wegen der Winde, die davon entstehen. Zur Zeit fehlenden Regens hingegen entstehen die Erdbeben, weil dann, wenn die Erde trocken ist, sie die Feuchtigkeit mit dem ihr eigenen Verlangen zu sich zieht. Und wenn ebenso das, was sie von den Wasserläufen in ihr anzieht, herabfällt, bewegt es sie wegen seiner Nähe zu ihr, und es entstehen Erdbeben, so wie der Wind und die Warme Flüssigkeit ein Zittern im ganzen Körper verursachen, wenn sie nach der Entleerung des Urins in die Blase eindringen'. Ce témoignage manque chez Diels-Kranz et chez Lur'e.

⁹⁰ Olympiod. *In Meteor.* 99, 20.

tir de l'eau de mer, qui a été décrit par plusieurs auteurs anciens à partir d'Aristote, remonte presque certainement à Démocrite.⁹¹

Les *Geoponica* sont donc un texte technique qui a sûrement été remanié à plusieurs reprises et enrichi. Il contient un matériau qui peut remonter à Théophraste ou à quelqu'un d'autre, mais on ne peut pas nier qu'il y ait aussi des éléments qui pourraient remonter à Démocrite. On ne peut certes pas le démontrer à l'aide de preuves incontestables, mais c'est également vrai pour les autres auteurs qui ont été considérés comme des sources par Oder et Steinmetz. Ce que je veux souligner, c'est qu'on ne peut pas l'exclure *a priori* sous le seul prétexte que Démocrite était le philosophe de l'atomisme. Je m'en tiens ici à ces exemples, qui me paraissent très révélateurs de la transmission de matériaux anciens à l'intérieur de la littérature technique. Ils invitent à adopter une position moins rigide que l'attitude consistant à attribuer aux écrits pseudo-démocritéens tout ce qui n'est pas en syntonie avec notre image du philosophe.

5. *Conclusions*

De ces observations un peu éparées on peut maintenant tirer quelques conclusions. La littérature technique la plus ancienne ne mentionne pas Démocrite, mais elle le connaît certainement. Peut-être est-ce contre des traités comme les siens que se défendaient les spécialistes des arts du Ve siècle avant J.-C. Les traités hippocratiques, l'agriculteur Ischomaque chez Xénophon et, plus tard, le cuisinier théoricien de Damoxène reflètent cette attitude des praticiens. Lorsque la dichotomie entre théorie et pratique n'est plus un thème de débat, Démocrite devient une autorité de premier plan pour les auteurs d'écrits techniques. Ses traités sont repris, remaniés et ils sont à l'origine de certaines falsifications. C'est dans cette lignée que se placent aussi les écrits de Bolos. C'est surtout entre le Ier siècle avant et le Ier siècle après J.-C. que l'on note un intérêt très vif pour le Démocrite technicien. Le catalogue de Thrasyllé nous dit que ses écrits étaient encore lus à cette époque et l'intérêt des disciples d'Asclépiade, de Soran et de Rufus d'Éphèse et des auteurs latins, tels que Pline et Columelle, confirme leur autorité au-delà de l'attribution des pseudo-*epigrapha*. Le crédit accordé à

⁹¹ Stückelberger (1984) 31ss. Pour un autre témoignage sur l'utilisation de vases par Démocrite, cf. Sen. *Quaest. nat.* IV 9, 1 ci-dessus, n. 19.

ces derniers témoigne lui-même de l'image très précise qu'on avait du savant d'Abdère à cette époque. C'est par leur transmission à l'intérieur de ce genre de littérature—qui remanie, mais également qui conserve, à certains égards—, que certains restes des écrits techniques démocritéens ont pu être conservés jusqu'à l'époque byzantine.

La littérature technique renvoie une image de Démocrite à laquelle nous ne sommes pas accoutumés, celle assurément d'un technicien qui théorise, mais aussi celle d'un savant très attentif aux procédés et à la pratique des arts. On ne doit pas rejeter totalement cette part non atomistique, non 'philosophique' de sa pensée, en se contentant de la classer sous la rubrique 'pseudo'. Il faut étudier les textes qui en relèvent, parce qu'ils nous invitent à reconsidérer également le Démocrite philosophe et sa doctrine.

DEMOCRITE A L'ACADEMIE?*

DENIS O'BRIEN

1. *Démocrite et Epicure*

Pourquoi l'atome est-il 'a-tomique'? Qu'est-ce qui rend l'atome 'insécable', 'in-cassable'? Si l'on en croit Diogène et d'autres auteurs, la réponse des premiers atomistes est simple. L'atome résiste à la division 'à cause de sa solidité' (διὰ τὴν στεργρότητα). Entendons: l'atome est trop dur pour qu'une force quelconque puisse le briser¹.

Si Epicure retient cette explication², c'est pour lui en ajouter une autre, plus subtile et plus difficile à comprendre³. L'atome, d'après Epicure, est constitué de parties qu'il appelle des 'limites' (πέρατα); mais la nature de ces 'limites' est telle qu'aucune ne peut subsister indépendamment d'une autre. Si l'atome résiste à la 'cassure', ce n'est donc pas seulement à cause d'un simple rapport de forces, la solidité de l'atome résistant à toute violence qui lui serait opposée. Ce qui rend impossible la fracture de l'atome est aussi la nature même de la substance atomique. L'atome d'Epicure est tel qu'aucune de ses 'limites' ne peut subsister détachée de l'ensemble.

Cette impossibilité en implique une autre. L'impossibilité d'une dispersion de ses parties ou de ses 'limites' rend en effet impossible que l'atome soit jamais anéanti. Epicure rétablit par ce biais le principe fon-

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¹ J'interprète en ce sens plusieurs témoignages: Diog. Laert. IX 44 (ἀπαθὴ καὶ ἀναλλοίωτα διὰ τὴν στεργρότητα); Plutarch. *Adv. Col.* VIII p. 1111 A (μήτε πάσχειν μήτε μεταβάλλειν τὰς ἀτόμους ὑπὸ στεργρότητος); Cic. *De fin.* I 6, 17 ('*individua propter soliditatem*', i.e. ἀδιαίρετα διὰ τὴν στεργρότητα); Dionysius (Denys d'Alexandrie), *ap.* Euseb. *Praep. evang.* XIV 23, 3 (p. 325.3 ed. Mras: ἀτόμους [...] λέγεσθαι διὰ τὴν ἄλντον στεργρότητα). Voir aussi Simpl. (?) *De an.* 64.2-4 (ἐξ ἀδαιρέτων διὰ ναστότητα).

² Dionysius (citée ci-dessus) s'exprime en ce sens. Voir aussi Galen. *De elem. sec. Hipp.* I 2 (vol. I, p. 418 ed. Kühn = p. 4.17 - p. 5.1 ed. Helmreich: ... ὑπὸ σκληρότητος ἄθραυστα, καθάπερ οἱ περὶ τὸν Ἐπίκουρον).

³ Epicur. *Ep. ad Her.* 55-59.

damental de toute philosophie se réclamant de la doctrine des Eléates: rien ne vient à l'existence, rien de ce qui est ne disparaît⁴.

(i)

L'enjeu est de taille. Mais le concept de partie ou de 'limite' qu'invoque Epicure n'est pas facile à cerner⁵. Fort heureusement, les propos alambiqués de la *Lettre à Hérodoté* ne sont pas les seuls dont nous disposons; la même théorie fait l'objet d'un long développement dans le poème de Lucrèce⁶. En rapprochant ces deux écrits, nous parvenons à dégager une analogie entre la pensée et la vision. Le point le plus petit que perçoit l'œil dans le domaine du visible correspond, dans l'enseignement d'Epicure, à la 'limite' que perçoit la pensée quand elle prend pour objet la substance atomique.

Commençons par la vision. Quand l'œil saisit l'extrémité (ἄκρον) d'un objet visible, aucun mouvement n'est plus possible. Si l'on essaie de balayer du regard le point extrême de l'objet que l'on perçoit, on ne peut que passer d'une 'extrémité' à l' 'extrémité' voisine. En fixant de son regard le point le plus petit d'un objet visible, et en cherchant à tourner, si peu que ce soit, son regard pour le voir sous un angle différent, on ne voit plus le même point; on en voit un autre.

Telle la vision, telle aussi la pensée. Les 'extrémités' de l'objet visible correspondent aux 'limites' de l'atome (πέρας, dans la lettre d'Epicure), aux 'parties minimales' (*minimae partes*, dans le poème de Lucrèce). De même que la perception visuelle ne permet pas de balayer du regard le point extrême d'un objet visible, de même la pensée ne peut cerner, à l'intérieur d'une 'limite', d'autres 'limites'; à l'intérieur d'une 'partie', d'autres 'parties'.

Cette impossibilité ne relève pas d'une incapacité de la pensée, mais bien de la nature de son objet. Il ne peut y avoir de limite qui soit la limite d'une limite. Il ne peut y avoir de partie plus petite que la partie qui est déjà, par définition, la plus petite possible.

⁴ Cf. Epicur. *Ep. ad Her.* 38–39.

⁵ Sur la distinction de 'partie' et de 'limite', voir *Note complémentaire 2* à la fin de cet article.

⁶ Lucret. *De rer. nat.* I 599–634. Voir aussi I 748–752.

(ii)

Ainsi s'expliquerait, selon Epicure, que de telles 'limites' ne puissent subsister indépendamment de l'atome dont elles sont les 'limites'. Il ne faut pas en effet se représenter les 'limites' comme autant de briques dont serait constitué l'atome, comme si l'agrégation ou la désagrégation de ses parties permettait la construction ou la dissolution d'un atome. La conception d'Epicure est tout autre. L'atome, étant d'une certaine grandeur, ne peut pas ne pas avoir de 'limites'. Mais ces 'limites' ne peuvent exister autrement que comme les 'limites' d'un atome.

Epicure est formel à ce propos: ce n'est pas à la suite d'un rassemblement (d'une συμφορῆσις) de ses 'limites' que l'atome viendrait à l'existence⁷. Entendons: ce n'est pas non plus à la suite d'une dispersion de ses 'limites' que l'atome pourrait être anéanti.

Pour emprunter un terme au Stagirite, l'atome est l'élément; les parties ou les 'limites' ne sont pas les éléments d'un élément. Les 'limites' d'un atome ne peuvent subsister séparées les unes des autres; elles ne peuvent subsister en dehors de l'atome. Le rassemblement de 'limites' n'engendre pas l'atome. Aucune dispersion de ses 'limites' n'en saurait provoquer la dissolution.

(iii)

Cette nouvelle conception de la partie ou de la 'limite' ne va pas sans modifier d'autres aspects de la théorie primitive telle que la présenteraient les premiers atomistes. Elle suppose notamment une modification de la théorie que proposait Démocrite de la 'forme' ou de la 'figure' des atomes.

Rapprochons les propos d'Aristote, rapportés par Simplicius dans son commentaire sur le *De caelo*, de ceux de Théophraste, rapportés par le même auteur dans son commentaire sur la *Physique*. Si l'on fait confiance au témoignage d'Aristote, les différences dans la forme des atomes seraient 'innombrables' (ἀναρίθμους)⁸. Théophraste, évoquant la même thèse, en fournit l'explication: il n'y aurait aucune raison pour

⁷ Epicur. *Ep. ad Her.* 59. Voir aussi Lucret. *De rer. nat.* I 611 (les atomes ne seraient pas construits 'ex illorum [sc. cacuminum] conventu [i.e. συμφορῆσις?] conciliata').

⁸ Aristot. *ap. Simpl. De cael.* 295.16-18. Simplicius renvoie, en 294, 33 - 295, 1, à l'écrit d'Aristote intitulé 'Sur Démocrite'.

qu'un atome soit d'une forme plutôt que d'une autre (διὰ τὸ μηδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον εἶναι)⁹.

Il n'en reste pas moins une différence de terminologie. Si l'on en croit Aristote, les différences de forme sont 'innombrables' (ἀναρίθμους), tandis qu'au dire de Théophraste la multiplicité des formes est 'illimitée' ou 'infinie' (ἄπειρον)¹⁰. Aristote use du même terme ('infini') pour rappeler la doctrine de Démocrite, à la fois dans le *De caelo* et dans le *De generatione et corruptione*¹¹. A relire ces textes, on se demande: les différences 'innombrables' (ἀναρίθμους) sont-elles, de ce fait, 'infinies' (ἄπειρους)?

Pour Aristote, sans doute, la réponse est positive. Ainsi s'explique qu'il qualifie les différences de figure tantôt d' 'innombrables' (ἀναρίθμους), quand il résume la théorie dans son traité 'Sur Démocrite', tantôt d' 'infinies' (ἄπειρα), quand il critique la même théorie dans les traités qui nous sont parvenus.

Le premier de ces deux adjectifs (ἀναρίθμους) est un *hapax* dans l'œuvre d'Aristote; il est par conséquent fort possible que ce soit le terme même qu'employait Démocrite¹². On comprend toutefois qu'Aristote (ainsi que, plus tard, Théophraste et d'autres) lui ait substitué le terme plus courant d' 'infini'. Le principe invoqué (διὰ τὸ μηδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον εἶναι) conduirait en effet à une multiplicité de formes telle qu'on ne pourrait les énumérer; elles seraient donc 'innombrables' (ἀναρίθμους). D'après le même principe, il n'y aurait pas de limite à la diversité de formes; elles seraient, par conséquent, 'illimitées' ou 'infinies' (ἄπειρους).

Il n'est donc pas étonnant qu' 'infini' et 'innombrable' soient pris, dans ce contexte, comme synonymes.

⁹ Theophr. *ap. Simpl. Phys.* 28.9–10 (Leucippe); 25–27 (Démocrite). Voir Diels (1879) 483–484 (*Theophrasti Physicorum opiniones*, fr. 8).

¹⁰ Theophr. *ap. Simpl. Phys.* 28, 9–10 (σχημάτων ἄπειρον τὸ πλῆθος).

¹¹ Aristot. *De cael.* III 4. 303a11–12 (ἄπειρα [...] τὰ σχήματα); *De gen. et corr.* I 1. 314a22–23 (ἄπειρα [...] τὰς μορφάς). Voir aussi I 8. 325b27–28 (ἀπείροις [...] σχήμασι). Au premier livre du *De anima*, tant les 'formes' que les 'atomes' sont 'infinis' (I 2. 404a1–2: ἀπειρῶν [...] ὄντων σχημάτων καὶ ἀτόμων). Je réunis dans cette note des textes où Aristote renvoie à Leucippe et à Démocrite conjointement (*De cael.* III 4; *De gen. et corr.* I 1), et des textes où il renvoie ou bien à Leucippe, sans mentionner le nom de Démocrite (*De gen. et corr.* I 8), ou bien à Démocrite, ne citant que sous forme de parenthèse le nom de Leucippe (*De an.* I 2; cf. 404a5). Je ne prétends pas en effet distinguer sur ce point les doctrines des deux philosophes.

¹² Dionysius aussi prête à Démocrite l'emploi de ce terme, pour désigner des atomes 'innombrables en multiplicité' (*ap. Euseb. Praep. evang.* XIV 23, 2 = p. 324.16 ed. Mras: πλῆθος ἀνάριθμα).

(iv)

Epicure refuse cette synonymie¹³. Comme s'il visait la formule même d'Aristote, Epicure affirme que les différences de forme, bien qu'elles soient 'insaisissables' (ἀπερίληπτοι), ne sont pas 'à proprement parler infinies' (οὐχ ἀπλῶς ἄπειροι).

Admettons cette absence de synonymie. Admettons que, si l'infini est insaisissable, l'insaisissable n'est pas nécessairement infini. Constatons toutefois que l'emploi que fait Epicure du terme 'insaisissable' (ἀπερίληπτος) ne contredit pas formellement l'emploi que nous prêtons à Démocrite du terme 'innombrable' (ἀνάριθμος). Comment en effet 'énumérer' ce que l'on ne 'saisit' pas? Comment 'saisir' ce que l'on ne peut 'énumérer'?

Epicure ne s'oppose donc pas à la terminologie dont usait, semble-t-il, Démocrite. En affirmant que les différences de forme dans les atomes sont 'insaisissables', Epicure ne contredit pas formellement la doctrine primitive de Démocrite (à supposer que Démocrite ait employé le terme 'innombrable' retenu par Aristote dans les propos rapportés par Simplicius). Les différences de forme dans les atomes seraient 'innombrables', selon Démocrite, 'insaisissables', selon Epicure, sans qu'il y ait de contradiction dans l'emploi de ces deux termes.

Epicure s'oppose toutefois *expressis verbis* à la formule retenue par Aristote dans d'autres textes pour désigner cet aspect de la théorie de Démocrite. Si l'on en croit Aristote dans le *De caelo* et dans le *De generatione et corruptione*, la diversité de formes serait, pour Démocrite, 'infinie' (ἄπειρος). Selon Epicure, les formes diverses sont 'insaisissables', mais ne sont pas 'à proprement parler infinies' (οὐχ ἀπλῶς ἄπειροι)¹⁴.

(v)

Reprenons les trois composés négatifs: 'in-saisissable' (ἀ-περίληπτος), 'in-nombrable' (ἀν-ἀριθμος), 'in-fini' (ἄ-πειρος). De ces trois termes, Epicure adopte le premier: 'insaisissable'. Il passe sous silence le deuxième: 'innombrable'. Il refuse expressément le troisième: 'infini', à tout le moins si on le prend en un sens absolu (ἀπλῶς). Essayons de

¹³ Epicur. *Ep. ad Her.* 42.

¹⁴ Je traduis ici l'adverbe ἀπλῶς ('simplement', 'absolument') par 'à proprement parler' pour faire ressortir la nuance que je prête au mot dans ce contexte.

dégager, ne fût-ce qu'à titre d'hypothèse, l'arrière-fond historique de cette différence de terminologie.

Démocrite—en toute innocence, si l'on peut dire—employait le terme ἀνάριθμος pour désigner les différences 'innombrables' dans la forme des atomes. Aristote, dans son livre 'Sur Démocrite', retenait le terme primitif employé par Démocrite, quitte à lui en substituer un autre quand il critiquait la théorie. Aussi Aristote écrit-il ἄπειρος à la place de ἀνάριθμος dans les traités qui nous sont parvenus, considérant sans doute les deux termes comme synonymes¹⁵.

Epicure refuse cette synonymie. Les différences de forme dans les atomes ne sont pas en effet, pour lui, infinies. Epicure ne reprend toutefois pas le terme primitif qu'employait Démocrite (ἀνάριθμος), mais lui en préfère un autre (ἄπεριληπτος), qu'il oppose expressément au terme qu'employait Aristote. Les différences 'insaisissables' ne sont pas de ce fait 'à proprement parler infinies' (ἄπλως ἄπειροι).

Pourquoi Epicure refuse-t-il, dans ce contexte, la terminologie qu'employait Aristote? Pourquoi tient-il à corriger sur ce point, sinon la théorie primitive, à tout le moins la présentation qu'en avait faite Aristote, et que reprendront Théophraste et d'autres?

Pourquoi, en effet, Epicure passe-t-il sous silence le principe, pourtant fondamental, de l'indifférenciation (τὸ μηδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον εἶναι), et pourquoi (par voie de conséquence?) refuse-t-il le terme d'ἄπειρος pour lui en substituer un autre (ἄπεριληπτος), que l'on aurait pu croire synonyme ou presque? Qu'est-ce qui sépare, dans ce contexte, l' 'infini' de l' 'insaisissable'?

(vi)

Lucretius, exposant la théorie du Maître, nous donne le mot de l'énigme. La théorie des 'parties' ou des 'limites' de l'atome ne permet pas de multiplier à l'infini les différences de forme¹⁶.

¹⁵ Je tiens à souligner que la distinction en question – l'emploi, par Démocrite, du terme ἀνάριθμος, la substitution, par Aristote, du terme ἄπειρος – n'est proposée qu'à titre d'hypothèse. Qu'ἀνάριθμος soit le terme même employé par Démocrite n'est pas attesté par Aristote; il ne s'agit que d'une déduction de ma part, fondée sur la présence de ce terme dans la citation que fait Simplicius du livre d'Aristote *Sur Démocrite* (*De cael.* 295.16–18), et sur son absence dans les écrits d'Aristote qui nous sont parvenus en tradition directe.

¹⁶ Lucret. *De rer. nat.* II 478–499.

Dans la philosophie d'Epicure, la forme d'un atome est une conséquence de la disposition de ses parties¹⁷. Pour qu'une forme diffère d'une autre, il est donc nécessaire que la configuration des parties ne soit pas la même. Telle partie doit en effet se placer différemment par rapport à telle autre, pour que la conjonction des parties, et par conséquent la forme, varie d'un atome à l'autre. Mais comment concevoir que cette variété soit multipliée à l'infini?

Les parties d'un atome ne peuvent se chevaucher. Si, en effet, l'une des parties ne recouvrait pas entièrement l'autre, les deux parties ne seraient plus alors des 'limites' (πέρατα), des 'parties minimales' (*'minimae partes'*), dans la mesure où le rapport des deux parties permettrait de distinguer, à l'intérieur d'une même limite, une ligne de démarcation séparant le morceau 'recouvert' de celui qui ne le serait pas. Le chevauchement permettrait ainsi de distinguer une 'partie' à l'intérieur d'une 'partie', une 'limite' à l'intérieur d'une 'limite'—conclusion qui serait contraire à l'hypothèse de départ¹⁸.

Les parties ne peuvent donc que se juxtaposer, et non pas se chevaucher. Mais un nombre fini de parties, en se juxtaposant les unes aux autres, ne produit qu'un nombre limité de formes, si bien qu'à partir d'un certain degré de complexité, la diversité de formes, issue d'un nombre limité de parties, atteint nécessairement un terme.

Pour dépasser ce terme, et pour accroître les différences de forme, il faudrait que s'accroisse aussi le nombre de parties, puisque seule l'adjonction d'une partie nouvelle et supplémentaire permettrait la production d'une nouvelle forme¹⁹. D'où il suit que seul un nombre infini de parties permettrait d'aboutir à une multiplicité infinie de formes.

Mais les parties des atomes, aussi petites soient-elles, ne sont pas de ce fait privées d'extension. Un nombre infini de parties ne pourrait donc qu'engendrer une augmentation infinie de grandeur, si bien que

¹⁷ 'Conséquence': la 'consécution' est ici, évidemment, logique et non pas temporelle. L'atome ne vient pas à l'existence à la suite d'un rassemblement de ses parties (voir n. 7 *supra*). Ainsi en est-il également quand je parle (ci-après) de telle partie qui 'se place' différemment par rapport à telle autre. La forme d'un atome est invariable; elle ne change pas à la suite d'une nouvelle collocation de ses parties.

¹⁸ 'Se chevaucher', 'chevauchement': j'introduis cette image pour mettre en évidence l'arrière-plan de l'argument élaboré par Lucrèce dans le passage cité (*De rer. nat.* II 478-499).

¹⁹ 'Adjonction', 'production': j'emploie ces deux termes en un sens figuré. Les atomes existent de toute éternité. Aucun atome n'est 'produit'. Une différence de forme n'est pas consécutive à l'adjonction d'une partie.

certains atomes ne seraient plus en deçà du seuil de la perception. Il devrait même y avoir des atomes très grands, voire des atomes que l'on pourrait percevoir²⁰.

Pour éviter cet effondrement de la théorie primitive, force est d'abandonner, pour ce qui est de la forme des atomes, le principe μηδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον. Telle est la conclusion qu'a tirée Epicure. Bien qu' 'insaisissables', les différences de forme n'en sont pas pour autant 'à proprement parler infinies' (ἀπλῶς ἄπειροι).

(vii)

Cette conséquence de l'innovation doctrinale apportée par Epicure à la théorie des premiers atomistes, si simple soit-elle, a échappé à une bonne partie des commentateurs, tant anciens que modernes, qui mettent sur le compte de Démocrite l'existence d'atomes très grands, voire gigantesques²¹. Ainsi en est-il quand Dionysius (évêque d'Alexandrie au III^e siècle, cité par Eusèbe) oppose, aux atomes 'très petits et imperceptibles' d'Epicure, les atomes 'très grands' de Démocrite²². Ainsi en est-il quand Diogène déclare que les atomes de Démocrite sont 'infinis' à la fois 'en grandeur et en nombre'²³. Ainsi en est-il, enfin, quand Aétius va jusqu'à mentionner la possibilité d'un atome 'de la grandeur d'un cosmos'²⁴.

Les propos de ces trois auteurs vont à l'encontre du témoignage d'Aristote. Ce dernier affirme expressément que la petitesse des atomes les rend imperceptibles. Les atomes de Leucippe, écrit-il, sont 'invisibles

²⁰ Une série infinie de grandeurs (par exemple: un demi, un troisième, un quart, un cinquième...) n'aboutit pas nécessairement à une grandeur infinie. Mais si l'on refuse, en bon 'atomiste', la possibilité d'une division à l'infini, une série infinie de grandeurs (par exemple: un sixième, un sixième plus un sixième, un sixième plus un sixième plus un sixième...) produit nécessairement une grandeur toujours plus grande. D'où la nécessité d'une limite au nombre de parties si l'on veut éviter 'toute grandeur' dans les atomes (cf. Epicur. *Ep. ad Her.* 55: ἀλλὰ μὴν οὐ δεῖ νομίζειν πᾶν μέγεθος ἐν ταῖς ἀτόμοις ὑπάρχειν).

²¹ Je résume, sur ce point, les conclusions de mes recherches antérieures. Voir O'Brien (1982) 187–203, et (1981) 282–298.

²² Dionysius *ap.* Euseb. *Praep. evang.* XIV 23, 3 (p. 325.1–2 ed. Mras: ὁ μὲν [sc. Ἐπίκουρος] ἐλαχίστας πάσας καὶ διὰ τοῦτο ἀνεπαυσθήτους, ὁ δὲ καὶ μεγίστας εἶναι τινας ἀτόμους ὁ Δημόκριτος ὑπέλαβεν).

²³ Diog. Laert. IX 44 (τὰς ἀτόμους [...] ἀπείρους εἶναι κατὰ μέγεθος καὶ πλῆθος).

²⁴ Aet. I 12, 6 (δυνατὸν <δ> εἶναι κοσμοαίαν ὑπάρχειν ἄτομον).

à cause de leur petitesse²⁵. Les atomes de Démocrite sont 'des substances tellement petites qu'elles échappent à nos sens'²⁶.

Epicure ne s'écarte pas, sur ce point, de la doctrine primitive. Il n'y a pas de grandeur 'infinie' dans les atomes, écrit-il dans la *Lettre à Hérodoté*²⁷. Il n'y a donc pas d'atome suffisamment grand pour qu'il soit visible²⁸.

Comment expliquer qu'un Dionysius, un Diogène, un Aétius opposent sur ce point, ne fût-ce qu'implicitement, la doctrine de Démocrite à celle d'Epicure, se mettant ainsi en contradiction avec le témoignage d'Aristote?

Si les doxographes prêtent à Démocrite la thèse d'atomes 'très grands', si Aétius va jusqu'à mentionner la possibilité d'un atome de la 'grandeur d'un cosmos', c'est parce qu'ils reprennent le raisonnement développé par Lucrèce: une diversité infinie de formes supposerait une multiplicité infinie de parties, donc l'existence d'un atome *immani maximitate*²⁹.

Le raisonnement est juste. Mais l'on ne peut prêter à Démocrite cette conclusion (l'existence d'atomes très grands) que si on lui en prête aussi les deux prémisses, à savoir une multiplicité infinie de formes et une multiplicité infinie de parties. Or, la doctrine des parties ou des 'limites' est une innovation d'Epicure. Cette innovation exclut l'existence, dans un même atome, d'un nombre infini de parties et impose, par voie de conséquence, l'abandon de la théorie d'une multiplicité infinie de formes.

Ainsi s'explique l'erreur des doxographes et des commentateurs. Prêtant à Démocrite l'innovation d'Epicure ('parties' ou 'limites' des atomes), ils continuent à lui attribuer la théorie d'une multiplicité infinie de formes. Ils se croient, dès lors, en droit de mettre sur le compte de l'Abdérain la thèse d'atomes 'infinis en grandeur et en nombre'

²⁵ Aristot. *De gen. et corr.* I 8. 325a30 (ἀόρατα διὰ μικρότητα τῶν ὄγκων).

²⁶ Aristot. *ap. Simpl. De cael.* 295,5–6 (οὕτω μικρὰς τὰς οὐσίας, ὥστε ἐκφυγεῖν τὰς ἡμετέρας αἰσθήσεις).

²⁷ Epicur. *Ep. ad Her.* 55–57.

²⁸ Epicur. *Ep. ad Her.* 56 (... οὐδ' ὅπως ἂν γένοιτο ὄρατὴ ἄτομος ἔστιν ἐπινοήσαι). Pour refuser la possibilité d'un atome 'visible', Epicure se fonde sur la taille des atomes: les atomes ne sont pas tous de la même grandeur, mais aucun atome n'est assez grand pour qu'on puisse le voir. S'exprimant de la sorte, il ne tient pas compte de la possibilité (évoquée par certains commentateurs modernes) que de très grands atomes (voire un atome de la grandeur d'un cosmos) pourraient bien exister, sans toutefois qu'ils soient 'visibles', puisqu'un atome isolé ne pourrait émettre des 'effluves'.

²⁹ Lucret. *De rer. nat.* II 498.

(Diogène) et, partant, la possibilité d'un atome 'grand comme un cosmos' (Aétius).

La vérité est tout autre. Tant pour Démocrite que pour Epicure, les différences de grandeur dans les atomes ne sont pas infinies. Pour Démocrite comme pour Epicure, les atomes ne dépassent jamais le seuil d'une perception sensible³⁰.

(viii)

La mise à nu de l'erreur des doxographes permet de saisir, dans toute sa clarté, la différence doctrinale qui sépare le système de Démocrite de celui d'Epicure.

Pour Démocrite, de même que pour Epicure, aucun atome ne dépasse le seuil de la perception sensible. Il n'y aurait donc, ni pour l'un ni pour l'autre, de différences infinies de grandeur. Mais il n'en va pas de même des différences de forme. Pour Démocrite, les atomes sont infinis en nombre; les différences de forme sont, elles aussi, innombrables, voire infinies. Rien en effet ne permet de privilégier telle forme plutôt que telle autre. Toute limite imposée à la diversité des formes devient ainsi arbitraire.

Epicure ne le suit pas sur ce point. Pour Epicure, les différences de forme, bien qu' 'insaisissables', ne sont pas 'simplement infinies'. Epicure reprend ainsi, mais pour l'écarter, le terme même ('infini') qu'employait Aristote quand il résumait, pour la critiquer, la doctrine de Démocrite. D'après Epicure, sont 'infinis' l'univers (τὸ πᾶν), le nombre des atomes et l'étendue du vide, ainsi que la pluralité des 'mondes' (κόσμοι) qu'ils constituent³¹. Sont aussi 'infinis' (entendons: 'infinis' en nombre) les atomes qui manifestent telle forme plutôt que telle autre. Mais si les différences de forme sont 'insaisissables', elles n'en sont pas pour autant 'à proprement parler infinies'³².

Le refus qu'Epicure oppose à ce terme d' 'infini' est la conséquence d'une nouvelle conception de l'atome. L'atome ne serait plus pour Epi-

³⁰ Pour l'interprétation adoptée par P.-M. Morel des textes que nous venons de citer, voir, à la fin de cet article, *Note complémentaire 1*.

³¹ Epicur. *Ep. ad Her.* 41-45.

³² Epicur. *Ep. ad Her.* 42 (καθ' ἐκάστην [...] σχημάτων ἀπλῶς ἄπειροί εἰσιν αἱ ὅμοιαι [sc. ἄτομοι], ταῖς δὲ διαφοραῖς οὐχ ἀπλῶς ἄπειροι, ἀλλὰ μόνον ἀπερίληπτοι). Voir aussi Lucret. *De rer. nat.* II 478-521 (les variétés de forme sont finies) et 522-568 (le nombre d'atomes, pour chacune des formes, est infini).

cure, comme il l'était pour Démocrite, 'a-tomique', donc 'in-sécable', à cause de sa seule solidité. Pour Epicure, si l'atome est indivisible, c'est—paradoxalement—à cause de la nature de ses parties ou de ses 'limites'. Bien que l'atome soit *constitué* de parties, il ne peut pas *se diviser* en parties. Les parties d'un atome sont en effet de nature telle qu'elles ne peuvent subsister indépendamment les unes des autres, tant et si bien qu'elles ne peuvent jamais se trouver séparées de l'atome. L'inséparabilité des parties rend l'atome 'a-tomique', 'in-sécable', 'incassable'³³.

La présence dans l'atome de parties ou de 'limites' met un terme à la multiplicité infinie de formes. Une multiplicité infinie de formes ne pourrait qu'entraîner, dans un même atome, une multiplicité infinie de parties, donc un accroissement infini de grandeur. La nouvelle doctrine des parties exige, dès lors, que l'on abandonne—ou que l'on refuse—la thèse de formes infinies en variété.

Ainsi se comprend l'importance de la correction apportée par Epicure à la terminologie d'Aristote. Ce dernier se croyait en droit de considérer comme synonymes 'innombrable' et 'infini'. Epicure, assumant les conséquences de sa nouvelle doctrine des 'limites' de l'atome, refuse l'emploi du terme aristotélicien. Les différences de forme dans les atomes sont 'insaisissables'. Elles n'en sont pas pour autant 'à proprement parler infinies'.

2. *Epicure et Aristote*

Comment expliquer cette modification profonde dans la conception de l'atome? Pourquoi Epicure a-t-il remanié la théorie primitive au point de postuler l'existence de 'limites' et d'abandonner, par voie de conséquence, une variation illimitée dans la multiplicité des formes?

A cette question Simplicius apporte une réponse, bien qu'il la fasse précéder d'un 'peut-être' (ἵσως). Epicure, écrit-il, admettait la notion de 'parties' dans les atomes pour mieux contourner les critiques qu'Aristote adresse aux premiers atomistes³⁴.

³³ Je parle de 'parties', suivant en ceci Lucrèce et d'autres. Epicure, exposant sa théorie dans la *Lettre à Hérodoté*, parle de 'limites'. Voir, à la fin de cet article, *Note complémentaire 2*.

³⁴ *Simpl. Phys.* 925.13–22 (ligne 18: ἵσως). Pour la terminologie de ce passage, voir *Note complémentaire 2* à la fin de cet article.

Aristote refuse en effet la notion d'un corps 'in-sécable'. Son refus n'a rien d'arbitraire; il repose sur la conception même que se fait Aristote de la continuité.

(i)

Ligne, surface et corps, d'après Aristote, sont continus³⁵. Pareille continuité suppose la possibilité d'une division à l'infini. Non point que ligne, surface ou corps soient composés d'un nombre infini de parties; mais ils sont tels qu'une division peut s'effectuer à n'importe quel endroit, aucun obstacle ne s'opposant à la possibilité d'une division à tel endroit plutôt qu'à tel autre.

La ligne, par exemple, comporte un nombre infini de points. A chacun de ces points peut s'effectuer une division, sans pourtant que ces points soient des composants de la ligne. Les points, en effet, n'ont pas d'extension. Si, 'dans' la ligne, les points se trouvent en nombre infini, ce n'est que parce que la ligne est divisible à n'importe quel endroit, à n'importe quel point, si bien qu'elle est, en ce sens, divisible à l'infini.

Il en va de même du temps. 'Le maintenant' (τὸ νῦν) est un passage du passé à l'avenir. 'Les maintenant' existent, par conséquent, en nombre illimité, sans pour autant que le temps soit composé de 'maintenants' et sans que l'on soit obligé de traverser un nombre infini de 'maintenants' pour traverser tel ou tel intervalle fini de temps³⁶.

Par le biais de cette conception de l'espace et du temps, Aristote pense éluder les paradoxes de Zénon. Ni Achille ni la tortue ne doivent traverser un nombre infini d' 'espaces', ni non plus un nombre infini de 'temps'³⁷. Ni l'espace ni le temps ne sont en effet composés d'un nombre infini de 'points' (l'espace) ou de 'maintenants' (le temps). Rien donc n'interdit de traverser un espace limité en un temps défini. Il n'en reste pas moins vrai que l'espace comporte, en nombre infini,

³⁵ Je résume Aristot. *Phys.* IV 10–11. 217b29–220a26, et VI 1. 231a31–b18; *De cael.* III 1. 299a1–300a19.

³⁶ 'Le maintenant' (τὸ νῦν): traduisant de la sorte, je risque d'offusquer mes lecteurs francophones. Suivant le principe *si peccas, pecca fortiter*, j'irai même jusqu'à écrire 'les maintenant' (τὰ νῦν). Comment en effet traduire autrement ? 'L'instant' et 'le moment' ne sont pas privés d'extension temporelle (encore que la durée d'un instant soit minime); ce ne sont point par conséquent, pour Aristote, des 'maintenants'.

³⁷ Aristot. *Phys.* VII 9–10. 239b5–241a6.

des points où peut s'arrêter le mouvement, et que le temps comporte un nombre infini de 'maintenants' qui séparent le passé de l'avenir.

En somme, tant l'espace que le temps sont constitués de façon telle qu'ils sont divisibles à l'infini, sans pour autant que l'espace soit composé d'un nombre infini de points et sans que le temps soit composé d'un nombre infini de 'maintenants'.

(ii)

Telle est 'peut-être' la théorie, si l'on en croit Simplicius, qu'Epicure cherche à renverser. La conception aristotélicienne du 'continu' interdit toute possibilité d'un corps indivisible. Epicure ne peut tolérer ce refus du principe même de l'atomisme. Il cherche par conséquent à remplacer la théorie d'Aristote par une conception nouvelle des *perata*, des 'limites'.

Les 'limites' d'Epicure ne sont pas les 'points' d'Aristote. A la différence des 'points' d'Aristote, les 'limites' d'Epicure possèdent une extension, sans que cette extension minimale puisse tolérer une division quelconque, et sans que l'on puisse séparer une 'limite' d'une autre.

Epicure refuse par conséquent une divisibilité à l'infini. Il refuse une division opérée à n'importe quel endroit (à n'importe quel 'point') du continu. Il s'oppose ainsi à la conception même que se faisait Aristote de la nature de la ligne, de la surface et du corps.

S'opposant ainsi à Aristote, Epicure garde intact le principe fondamental de l'atomisme, à savoir l'existence d'une extension minimale et indivisible. La modification apportée à la théorie est pourtant radicale. L'extension minimale, ce n'est plus l'atome, c'est la 'limite' d'un atome. Si l'atome résiste à la fracture, il ne résiste pas—il ne résiste plus—à une division conceptuelle. Ce ne sont que les 'limites', les parties, des atomes qui résistent à toute division, tant conceptuelle que physique.

3. *Epicure et Platon*

Si l'on en croit Simplicius, Epicure est 'peut-être' redevable à Aristote de cette conception nouvelle de l'atome. Cherchant à réfuter les critiques qu'Aristote adressait à Démocrite, Epicure est amené à admettre, à l'intérieur de l'atome, la présence de parties, bien que l'extension minimale de ces parties exclue toute possibilité de division ainsi que

toute possibilité que de telles parties puissent subsister indépendamment l'une de l'autre.

S'opposer à Aristote, c'est, en un sens, subir son influence. Héritier du Lycée, Epicure l'est-il aussi de l'Académie?

(i)

La théorie des éléments exposée dans le *Timée* relève de la géométrie davantage que de ce que nous appellerions, nous, la physique³⁸. Les quatre éléments d'Empédocle (l'air, le feu, l'eau et la terre) correspondent à quatre polyèdres réguliers. Aussi la terre est-elle un cube, le feu, une pyramide (non pas une 'pyramide' telle qu'on les trouve en Égypte, mais une pyramide dite triangulaire, un tétraèdre). Des deux éléments intermédiaires, l'air est un octaèdre et l'eau, un icosaèdre. Un cinquième polyèdre, le dodécaèdre, est réservé à la forme de l'univers.

Les faces des quatre polyèdres élémentaires sont composées de triangles. Les faces du cube sont composées de 'demi-carrés' (à savoir de triangles dont l'hypoténuse est la diagonale d'un carré). Les faces des trois autres polyèdres élémentaires sont composées de 'demi-équilatéraux' (à savoir de triangles scalènes obtenus par la section d'un triangle équilatéral).

La dissolution des faces des polyèdres en des triangles constitutifs, suivie du rassemblement de ces triangles en des combinaisons différentes, permet la transformation d'un élément dans un autre, à une seule exception près. Les 'demi-carrés' ne se transforment pas en des 'demi-équilatéraux'. La terre ne peut donc se transformer en aucun autre élément.

(ii)

Telle est la doctrine de départ. Elle est simple. Plus complexe est la théorie qui fonde la variété des éléments³⁹. Chaque élément existe en plus d'une grandeur. L'eau 'fusible' (à savoir l'eau qui serait à l'origine des métaux) est constituée de très grands icosaèdres. Ce que nous appelons l'eau, l'eau que l'on voit contourner les pierres dans le lit d'une rivière, étant de ce fait plus fluide, est constituée, elle aussi,

³⁸ Plat. *Tim.* 53 C 4-57 C 6.

³⁹ Plat. *Tim.* 57 C 7-61 C 2.

d'icosaèdres, mais d'icosaèdres plus petits⁴⁰. Et il en va de même pour chacun des autres éléments. La diversité de taille de chaque espèce de polyèdre est à l'origine de l'immense diversité des objets qui nous entourent.

Or, la diversité de taille dans chaque espèce de polyèdre pose évidemment problème lorsque l'on considère la transformation des éléments. Deux possibilités sont à envisager. *Première possibilité*: la transformation des éléments est limitée aux polyèdres dont les triangles constitutifs sont d'une seule et même taille. *Seconde possibilité*: les faces des polyèdres plus grands se décomposent en une multiplicité de triangles telle que les triangles issus de la division d'un plus grand polyèdre, en se regroupant, forment plusieurs polyèdres d'un ordre de grandeur plus petit.

Cette seconde possibilité est à coup sûr celle que Platon entend souffler à l'oreille de son lecteur. Quand Timée construit la pyramide qui correspond au feu, il pourrait se limiter à deux triangles 'demi-équilatéraux' pour construire chacune des faces de ce polyèdre. Or il en emploie six⁴¹. La pyramide qu'il construit n'est donc pas de la plus petite taille possible. La décomposition de cette pyramide produirait en effet, non pas (4×2) huit, mais (4×6) vingt-quatre triangles élémentaires. Du rassemblement de ces vingt-quatre triangles 'demi-équilatéraux' peuvent résulter, soit trois pyramides $(4 \times 2 \times 3 = 24)$, soit une pyramide $(4 \times 2 = 8)$ et un octaèdre $(8 \times 2 = 16)$, à condition que ces nouveaux polyèdres soient d'un ordre de grandeur plus petit que celui de la pyramide primitive, chaque face ne comportant que deux triangles 'demi-équilatéraux'.

Suivant le même principe, tous les éléments (à l'exception de la terre) peuvent se transformer les uns dans les autres, indépendamment de la multiplicité des grandeurs qui caractérisent chaque type de polyèdre. D'après cette hypothèse, les faces de chaque polyèdre—que celles-ci soient grandes ou petites—se composent en effet de triangles qui sont tous, en fin de compte, d'une seule et même taille. Aussi peuvent-ils constituer, en nombre suffisant, la face d'un polyèdre de n'importe quel ordre de grandeur, assurant ainsi la transformation mutuelle de tous les éléments (exception faite, une fois encore, de la terre), indépendamment de la multiplicité de tailles différentes qui caractérisent chaque type de polyèdre.

⁴⁰ Plat. *Tim.* 58 D 4-59 C 5.

⁴¹ Plat. *Tim.* 54 D 5-55 A 4.

(iii)

Un problème demeure, d'ordre textuel⁴². Timée ne rend jamais explicite l'aspect de la théorie que je viens d'évoquer. Il laisse bien entendre que les variétés de chaque élément peuvent se transformer dans toutes les variétés de tous les autres éléments (toujours à l'exception de la terre). Mais il ne précise jamais que cette transformation universelle (ou quasi-universelle) n'est possible que parce que les éléments constitutifs de l'eau, de l'air et du feu se décomposent en triangles qui sont tous, en fin de compte, d'une seule et même grandeur.

Que telle soit bien l'une des prémisses implicites du raisonnement de Platon se trouve toutefois confirmé par le témoignage d'Aristote. Aristote fait état de la différence de taille qui caractérise chacun des polyèdres quand il parle des 'pyramides inégales' de feu⁴³. S'exprimant de la sorte, Aristote fait clairement allusion à une différence de taille dans les polyèdres constitutifs des variétés du feu⁴⁴. Mais Aristote décrit aussi les triangles qui constituent les polyèdres comme 'égaux'⁴⁵.

L'égalité des triangles élémentaires (ou 'subélémentaires') est la condition nécessaire à une transformation universelle des éléments (à l'exception toujours de la terre). Si les triangles les plus petits sont tous d'une seule et même taille, s'ils sont donc tous 'égaux', même les polyèdres les plus petits, en nombre suffisant, peuvent se transformer en plus grands polyèdres, et inversement: les plus grands polyèdres peuvent tous se transformer en polyèdres plus petits.

(iv)

Revenons à Epicure. Exposant, dans la *Lettre à Hérodoté*, sa théorie des 'extrémités' et des 'limites', Epicure affirme que, lorsque nous cherchons à regarder de part et d'autre d'une 'extrémité', ce qui se présente à l'œil est une nouvelle 'extrémité', 'égale' (cf. τὸ ἴσον), précise-t-il, à l'autre⁴⁶. S'exprimant de la sorte, Epicure fait savoir que toutes les 'extrémités' sont de taille égale. Or, si nous retenons, comme il se doit,

⁴² Ici encore, je résume les conclusions de mes recherches antérieures. Voir O'Brien (1984) 83–87.

⁴³ Aristot. *De cael.* III 8. 307b16–17.

⁴⁴ Voir sur ce texte O'Brien (1984) 355–356.

⁴⁵ Aristot. *De cael.* IV 2. 308b3–12 et b33–35 (308b9 et 34: ἴσων).

⁴⁶ Epicur. *Ep. ad Her.* 58.

l'analogie de la vision et de la pensée, les 'limites' de l'atome, pour Epicure, doivent être, elles aussi, 'égales'.

L'égalité est donc une propriété, non seulement des triangles élémentaires de Platon, mais aussi des *perata* d'Epicure. Si l'on s'en remet à Aristote, les faces des polyèdres dans le *Timée* se décomposent en des triangles qui sont tous, en fin de compte, égaux. Les 'limites' des atomes d'Epicure sont, elles aussi, égales les unes aux autres.

Aussi la théorie de Platon et celle d'Epicure se fondent-elles, toutes deux, sur l'existence de particules (triangles, 'limites') d'une dimension minimale et de taille égale. Elles s'opposent ainsi à la théorie d'Aristote, qui rend impossible toute notion de dimension minimale et indivisible.

Accord autant que désaccord suscitent la curiosité de l'historien. Est-il possible que, pour s'opposer à Aristote, Epicure se soit inspiré de Platon? L'égalité des *perata* est-elle tributaire de l'égalité des triangles?

(v)

Que la doctrine du *Timée* soit comparée à un système atomiste est moins insolite qu'on ne pourrait le croire. Aristote met en parallèle les triangles de Platon et les atomes de Leucippe⁴⁷. Les commentateurs modernes—dont J. Dillon, le dernier en date—abondent dans le même sens⁴⁸.

Les deux théories ont, en effet, ceci de commun que les corps élémentaires (atomes, polyèdres) sont privés de toutes les qualités (à l'exception, pour les atomes, de la pesanteur) que nous nous croyons en droit d'attribuer aux objets du monde extérieur⁴⁹. 'Chaud' et 'froid', 'dur' et 'mou', ne sont pas des 'qualités' intrinsèques aux objets que nous percevons. De telles qualités, tant pour Platon que pour Leucippe ou pour Démocrite, ne sont que le produit d'une action sur notre corps des différences de grandeur et de forme dans les corps élémentaires, qu'il s'agisse des polyèdres du *Timée* ou des atomes de Leucippe et de Démocrite.

⁴⁷ Aristot. *De gen. et corr.* I 8. 325b25–33. Voir aussi Alex. Aphr. *Met.* 36.12–18. Cf. O'Brien (1981) 211–222.

⁴⁸ Dillon (2003) 1–17.

⁴⁹ Je résume la thèse soutenue dans les deux tomes déjà cités, O'Brien (1981 et 1984).

Il est fort possible qu'en formulant cette doctrine dans le *Timée*, Platon se soit inspiré de Démocrite. Ce ne serait donc qu'un juste retour des choses si, voulant corriger la théorie primitive, Epicure s'était inspiré de Platon.

S'évertuant à contourner les critiques d'Aristote, Epicure va jusqu'à concéder l'existence de 'limites' dans les atomes. Les atomes d'Epicure n'en deviennent pas pour autant les polyèdres de Platon. A la différence des polyèdres, les atomes ne se transforment pas les uns dans les autres, car les *perata*, à la différence des triangles, ne peuvent se séparer pour ensuite se réunir. Les triangles 'subélémentaires' du *Timée* et les 'limites' d'Epicure ont pourtant ceci de commun que, par leur cumul, ils constituent des corpuscules élémentaires de tailles différentes (atomes, polyèdres), mais ne présentent pas en eux-mêmes—triangles par rapport aux triangles, 'limites' par rapport aux 'limites'—de différence de grandeur. Epicure s'est-il inspiré de Platon en retenant l'égalité des composants infimes de l'univers?

Note complémentaire 1.

La thèse de P.-M. Morel sur la taille des atomes

(i)

P.-M. Morel propose une interprétation différente des textes cités ci-dessus, relatifs à la taille des atomes dans le système de Démocrite⁵⁰. Il n'est pas 'sûr', écrit-il en effet, que 'le témoignage d'Aétius, sur l'atome gros comme un monde,' soit 'totalement infidèle'⁵¹. L'existence—ou la possibilité—de très grands atomes, poursuit-il, serait tirée d' 'une application logique et mathématique du principe d'isonomie'⁵².

⁵⁰ Voir Morel (1996) 254–263.

⁵¹ Morel (1996) 259.

⁵² Morel (1996) 259–261. Morel évoque à ce propos 'un conflit interne à la physique abdéritaine'. 'La thèse démocratéenne', écrit-il, 'n'est pas parfaitement cohérente.' Morel croit même déceler, chez Démocrite, les signes d'une 'hésitation'. 'Il semble', écrit-il, 'que, sur la question de la taille des atomes, Démocrite hésite', tiraillé entre un 'point de vue, théorique et logique', qui permettrait d' 'imaginer un atome très gros' (d'où le témoignage d'Aétius), et un 'point de vue, proprement physique', selon lequel 'ce cas de figure est inconcevable'. Dans cette *Note complémentaire* je ne chercherai pas à sonder de tels états d'âme. Je me bornerai à examiner les propos cités ci-dessus sur la 'fidélité' du témoignage d'Aétius et sur la possibilité de son rapport avec le principe d' 'isonomie'.

Le principe que Morel désigne sous le nom d' 'isonomie' est formulé par Théophraste⁵³. Or ce principe, dans le contexte où Théophraste l'a cité, s'applique aux différences de forme; nulle part, dans les sources dont nous disposons, il n'est dit s'appliquer aux différences de grandeur.

Il est peu probable que ce silence soit le fruit du hasard. Les atomes, si l'on en croit Aristote, sont trop petits pour être perceptibles⁵⁴; le principe d' 'isonomie', toujours à en croire Aristote, n'a donc pas été invoqué pour fonder l'existence d'une échelle de grandeurs, telle qu'il aurait pu y avoir des atomes 'gros comme un monde'.

Si l'on pense qu'au contraire le principe d' 'isonomie' a pu entraîner, pour Démocrite, l'existence de très grands atomes, voire la possibilité d'un atome 'gros comme un monde', on se voit donc contraint de rejeter le témoignage d'Aristote.

Mais pourquoi Aristote se serait-il trompé sur ce point? Qu'est-ce qui l'aurait induit en erreur? Comment se fait-il qu'Aristote ait défini les atomes comme 'des substances tellement petites qu'elles échappent à nos sens'⁵⁵ si, conformément au témoignage d'Aétius, il y en avait de très gros? Autant de questions auxquelles il serait difficile de répondre.

(ii)

Point n'est besoin de chercher des réponses. Aux dernières nouvelles, Morel a changé d'avis. La thèse qu'il soutient dans une publication plus récente n'est plus en effet la même⁵⁶.

Pour expliquer l'existence d'un atome 'gros comme un monde', Morel ne fait plus appel à 'une application logique et mathématique du principe d'isonomie'⁵⁷. 'La combinatoire démocratéenne', écrit-il dans sa nouvelle publication, 'n'est pas une pure logique de l'infini.'⁵⁸ Démocrite, pas plus qu'Epicure d'ailleurs, n'aurait adopté 'le point de vue strictement logique qui devrait imposer une isonomie parfaite'⁵⁹.

⁵³ Theophr. *ap. Simplicius, Phys.* 28.9–10 et 15–27 (τὸ μὴδὲν μᾶλλον τοιοῦτον ἢ τοιοῦτον εἶναι). Voir n. 9 *supra*.

⁵⁴ Voir les témoignages cités ci-dessus, n. 25 et n. 26.

⁵⁵ Aristot. *ap. Simplicius, De cael.* 295.5–6. Voir n. 26 *supra*.

⁵⁶ Voir Morel (2000) 21–23. Voir aussi pp. 37–40, où la nouvelle thèse est présentée sous un angle un peu différent.

⁵⁷ Cf. Morel (1996) 259–261 (cité ci-dessus).

⁵⁸ Morel (2000) 22.

⁵⁹ Morel (2000) 22.

Il n'est donc pas 'interdit', poursuit Morel, de penser que Démocrite, comme Epicure, croyait en 'une variation indéfinie des formes et des grandeurs', sans pour autant que le nombre de variétés, que ce soit dans les formes ou dans les grandeurs, soit 'rigoureusement et arithmétiquement infini'⁶⁰. Et Morel d'en conclure que Démocrite, comme Epicure, soutenait 'l'imperceptibilité des atomes'⁶¹.

Cette conclusion a l'immense avantage de ne pas exiger que l'on rejette le témoignage d'Aristote. Lorsque ce dernier affirme que les atomes sont trop petits pour être perceptibles, on peut le croire.

(iii)

Le problème n'en est pas résolu pour autant. Aristote est innocenté. Mais qui est donc à l'origine de l'erreur? D'où vient la doctrine d'un atome 'grand comme un monde'? Les épicuriens, voire Epicure lui-même, si l'on en croit Morel, attribuaient à Démocrite 'cette conséquence aberrante de l'infinitisme', puisqu'ils prêtaient à Démocrite à la fois 'une infinité de formes atomiques' et 'des atomes de toutes grandeurs'⁶².

En s'exprimant de la sorte, Morel ne fait que remplacer un problème par un autre. Comment en effet expliquer qu'Epicure, à la différence d'Aristote, ait mis sur le compte de Démocrite la thèse d' 'atomes gigantesques, "grands comme un monde"', et comment expliquer que, ce faisant, il se soit trompé?⁶³

Epicure a-t-il ignoré la doctrine de Démocrite au point de lui attribuer une thèse que ce dernier ne soutenait pas? Ou bien l'a-t-il faussée, attribuant à son prédécesseur à la fois une variété infinie de formes et une variété infinie de grandeurs, sachant pertinemment qu'en réalité la thèse de Démocrite était aussi la sienne?

Ignorance ou mauvaise foi? Ni l'une ni l'autre, à mon avis⁶⁴.

⁶⁰ Morel (2000) 22–23.

⁶¹ Morel (2000) 22.

⁶² Morel (2000) 22. J'écris: 'Les épicuriens, voire Epicure lui-même.' Dans le corps de son texte Morel ne mentionne que 'les épicuriens', mais il renvoie, entre parenthèses, à la *Lettre à Hérodote* (cap. 56). Le lecteur en déduit qu'Epicure est à l'origine de l'attribution.

⁶³ Morel (2000) 22.

⁶⁴ Voir O'Brien (1981) 285–286.

(iv)

La nouvelle thèse de Morel ne me semble pas plus convaincante que l'ancienne. Tel Dupont et Dupond, les deux thèses ne font en effet que se refléter, mais à l'inverse: *ou bien* Aristote se trompe, en prêtant à Démocrite des atomes très petits, alors qu'il y en avait de très gros (telle est la conséquence de la *première* thèse), *ou bien* Epicure se trompe, en prêtant à Démocrite des atomes très gros, alors qu'il n'y en avait que de très petits (telle est la conséquence de la *seconde* thèse).

Aucune de ces deux thèses n'emporte la conviction. Il est peu probable—à vrai dire, incroyable—qu'Aristote ou Epicure aient ignoré la doctrine de Démocrite. Et s'ils ne l'ont pas ignorée, il est peu probable qu'ils aient délibérément déformé l'enseignement de l'Abdéritain au point de lui prêter des atomes très petits, sachant qu'il y en avait de très gros, ou des atomes très gros, sachant qu'il n'y en avait que de très petits.

Pourquoi donc leur imputer de telles erreurs? Quand Aristote assigne à Démocrite la thèse d'atomes trop petits pour être perceptibles⁶⁵, il est fort probable qu'il ait puisé ce renseignement dans les écrits mêmes de Démocrite. Epicure, lui aussi, avait à sa disposition des écrits originaux de Démocrite, et dans la *Lettre à Hérodoté* il ne s'exprime pas différemment. Rien en effet ne nous oblige à croire qu'en évoquant l'impossibilité d'atomes de toutes grandeurs, Epicure ait pris pour cible, sans la nommer, la théorie de son prédécesseur⁶⁶.

(v)

L'erreur, puisqu'erreur il y a, est à chercher chez des auteurs qui n'avaient plus une connaissance directe des écrits des premiers atomistes. Ainsi peut-on comprendre qu'un doxographe, quel qu'il soit, n'ait pas su distinguer la doctrine de Démocrite de celle d'Epicure. Il a donc conjugué, à tort, la doctrine (démocritéenne) d'une variété illimitée de formes et la doctrine (épicurienne) de 'limites' ou 'parties' atomiques.

Ainsi s'explique que l'on trouve, dans les pages de Dionysius, des atomes 'très grands'⁶⁷, dans celles de Diogène, des atomes 'infinis en

⁶⁵ Aristot. *ap. Simpl. De cael.* 295,5–6 (cité ci-dessus, n. 26).

⁶⁶ Epicur. *Ep. ad Her.* 55–56.

⁶⁷ Dionysius, *ap. Euseb. Praep. evang.* XIV 23, 3 (p. 325,1–2 ed. Mras). Voir n. 22 *supra*.

grandeur et en nombre'⁶⁸, dans celles, enfin, d'Aétius, la possibilité d'un atome 'de la grandeur d'un cosmos'⁶⁹.

Cette explication du conflit dans les témoignages est bien plus simple que l'interprétation proposée par Morel. Aristote ne s'est pas trompé en prêtant à Démocrite des atomes imperceptibles. Epicure ne lui en a pas prêté de très gros. L'erreur qui met sur le compte de Démocrite la thèse d'atomes 'très grands', voire 'gros comme un cosmos', est celle d'un doxographe, qui s'est empêtré dans des questions de forme, de grandeur et de 'parties'⁷⁰.

Note complémentaire 2.

'Limites' et 'parties' dans les atomes d'Epicure.

(i)

Epicure, dans la *Lettre à Hérodoté*, parle des 'limites' (πέρατα) d'un atome⁷¹; il ne parle de 'parties' (μέρη) que pour écarter une conception erronée de la doctrine qu'il s'essaie de formuler. Il ne faut pas en effet, écrit-il, se représenter, dans l'extrême limite d'un objet visible, 'une distinction de parties' (διάληψιν [...] μερῶν)⁷². Il ne faut pas envisager, poursuit-il, l'ensemble d'extrémités comme si 'les unes touchaient, par leur parties, les parties des autres' (μέρεσι μερῶν ἀπτόμενα)⁷³.

Il me semble fort possible que la distinction de 'limites' et de 'parties' soit ici délibérée. Si l'on comprend d'emblée qu'une 'limite' ne

⁶⁸ Diog. Laert. IX 44. Voir n. 23 *supra*.

⁶⁹ Aet. I 12, 6. Voir n. 24 *supra*.

⁷⁰ Morel n'est pas seul à voir, dans la *Lettre à Hérodoté* (cap. 55–56: ἀλλὰ μὴν οὐδὲ δεῖ νομίζειν πᾶν μέγεθος ἐν ταῖς ἀτόμοις ὑπάρχειν...), une critique adressée à Démocrite. Bailey est, lui aussi, de cet avis, à cette différence près que, pour Bailey, Epicure ne se serait pas trompé: Démocrite, si l'on en croit l'exégète anglais, aurait bien admis l'existence de très grands atomes. Voir Bailey (1926) 204, et (1947) 701–702. La singularité de la thèse de Morel, dans sa deuxième version (2000, 22–23), est de donner raison à Bailey pour la critique implicite adressée à Démocrite et de lui donner tort pour l'existence de très grands atomes. Aussi Morel est-il amené à supposer, comme Bailey, que dans la *Lettre à Hérodoté* Epicure prenait pour cible, sans en nommer l'auteur, la thèse de Démocrite. Mais, contrairement à Bailey, il soutient en même temps qu'Epicure se leurrerait, en attribuant à Démocrite une thèse que ce dernier n'avait pas soutenue. Croira qui voudra.

⁷¹ *Ep. ad Her.* 59.

⁷² *Ep. ad Her.* 58.

⁷³ *Ep. ad Her.* 58.

peut exister séparément de l'objet dont elle est la 'limite', il n'en va pas de même des 'parties'. Si des parties existent, pourquoi en effet, se demandera-t-on, ne pourraient-elles pas se séparer les unes des autres?

D'où la différence de terminologie que nous venons de constater: l'auteur de la *Lettre à Hérodoté*, à la différence de Lucrèce, ne parle pas des 'limites' de l'atome comme d'autant de 'parties'.

(ii)

Cette méfiance à l'égard du terme 'partie' ne se retrouve pas chez Lucrèce; elle ne se retrouve pas non plus chez Simplicius quand, pour faire ressortir la différence qui sépare la doctrine de Démocrite de celle d'Epicure, il va jusqu'à déclarer que ce dernier renonçait à 'l'absence de parties' (τὸ [...] ἀμερές) dans les atomes⁷⁴.

Le terme de 'partie', dans ce témoignage de Simplicius, n'indique plus une représentation erronée de l'atome. Le terme 'partie' n'est plus en effet pour Simplicius, comme il l'était, semble-t-il, pour Epicure, trompeur, en ce sens qu'il évoque l'image que l'on ne doit pas adopter quand on essaie de se faire une idée des 'limites' atomiques. C'est bien plutôt le contraire: dans le texte de Simplicius, l'absence de 'parties' dans l'atome de Démocrite s'oppose, ne fût-ce qu'implicitement, à la présence de 'parties' dans l'atome d'Epicure⁷⁵.

Pour le savant exégète d'Aristote qu'était Simplicius, cette opposition permet de tirer au clair le paradoxe dans la conception nouvelle que se fait Epicure de la structure atomique. Pour Aristote, les 'maintenants' et les 'points' sont autant de 'limites', si bien qu'une 'limite' est privée d'extension et, de ce fait, indivisible⁷⁶. Les 'limites' s'opposent, par conséquent, aux 'parties'⁷⁷. Une 'partie', aussi petite soit-elle, est de même nature que ce dont elle est 'partie'. Les 'parties' d'un temps donné sont des temps plus brefs (continus et divisibles). Les 'parties' d'une ligne sont des lignes plus courtes (continues et divisibles).

⁷⁴ Simpl. *Phys.* 925, 13–22. Voir aussi *De cael.* 612, 16 (ἐξ ἀδιασρέτων καὶ ἀμερῶν). Ces deux textes sont traduits et commentés dans O'Brien (1981) 270–273.

⁷⁵ Dans un passage antérieur de son commentaire, Simplicius prête à l'atome de Démocrite 'parties et grandeur' (*Phys.* 82.1–6: μόρια [...] καὶ μέγεθος). La contradiction ('parties' en *Phys.* 82.1–6, 'absence de parties' en *Phys.* 925.13–22) n'en est pas vraiment une si nous tenons compte du contexte. Voir O'Brien (1981) 273–279.

⁷⁶ Aristot. *Phys.* IV 10. 218a24 (τὸ [...] νῦν πέρας ἐστίν); IV 13. 222a10–12 (τὸ [...] νῦν [...] πέρας χρόνου ἐστίν); I 2. 185b18–19 (τὸ [...] πέρας ἀδιαίρετον).

⁷⁷ Aristot. *Phys.* IV 11. 220a19–20 (οὐδὲν μόνιον τὸ νῦν τοῦ χρόνου [...] ὥσπερ οὐδ' ἡ στιγμή τῆς γραμμῆς).

Pour Aristote, il en va de même des surfaces et des corps. Tant les surfaces que les corps possèdent des extrémités qui sont autant de 'limites', privées d'extension et de ce fait indivisibles, tandis que les 'parties' sont de même nature que l'ensemble, que ce soient des surfaces plus petites ou des corps plus petits, les uns comme les autres continus et divisibles.

Présenter des 'limites' comme des 'parties' serait donc, dans le système d'Aristote, verser dans la contradiction. Si *per impossibile* la 'partie' était privée d'extension, elle ne serait plus une 'partie', mais une 'limite'. Inversement, si *per impossibile* la 'limite' possédait une extension, elle ne serait plus une 'limite', mais une 'partie'.

Telle est, cependant, la nouvelle conception de 'limite' que propose Epicure. La 'limite' n'est pas privée d'extension. De par son extension, elle permet de mesurer la grandeur d'un objet (un atome plus grand qu'un autre posséderait un plus grand nombre de 'limites'⁷⁸). La 'limite' d'Epicure est donc ce qu'Aristote appellerait 'partie'. Ces deux termes—ces deux concepts—ne sont plus en effet, pour Epicure, exclusifs l'un de l'autre.

(iii)

Constatons néanmoins que, dans la *Lettre à Hérodoté*, Epicure n'a pas présenté sa nouvelle doctrine sous cette forme. Simplicius a beau affirmer qu'Epicure renonçait à 'l'absence de parties' (τὸ ἀμερές) dans les atomes, il faut bien reconnaître que, dans la *Lettre à Hérodoté*, les atomes d'Epicure n'ont pas de 'parties'. Epicure parle des 'limites' d'un atome; il ne parle des 'parties' d'un atome que pour éviter un malentendu⁷⁹.

Les traducteurs d'Epicure ne rendent pas cette réticence. Ainsi en est-il, par exemple, de l'édition de C. Bailey, publiée par la Clarendon Press d'Oxford. Dans les chapitres de la *Lettre à Hérodoté* que je viens d'évoquer (chapitres 55 à 59), il n'y a que les trois occurrences du mot μέρη commentées ci-dessus⁸⁰. La traduction anglaise de Bailey comporte, pour ces mêmes chapitres, non pas trois, mais dix occurrences

⁷⁸ Epicur. *Ep. ad Her.* 58–59.

⁷⁹ Voir les textes cités ci-dessus, *Ep. ad Her.* 58: il ne faut pas se représenter, dans l'extrême limite d'un objet visible, 'une distinction de parties' (διάληψιν [...] μερῶν); il ne faut pas envisager l'ensemble d'extrémités comme si 'les unes touchaient, par leur parties, les parties des autres' (μέρεσι μερῶν ἀπτόμενα).

⁸⁰ Voir la note précédente.

du mot '*part*'. Multipliant à plaisir le terme de '*part*'⁸¹, Bailey n'est manifestement pas conscient de l'écart conceptuel qui sépare, dans le texte qu'il traduit, '*parties*' (μέρη) et '*limites*' (πέρατα).

Plus grave encore, le même traducteur rend τὸ ἴσον, non point par *equal*, mais par '*like*'⁸², allant jusqu'à écrire dans son commentaire: 'τὸ ἴσον, sc. *another ἄλλορον like the first*'⁸³. Traduisant et commentant de la sorte, Bailey obscurcit un aspect essentiel de la théorie d'Epicure. Les '*limites*' ne sont pas simplement '*semblables*' les unes aux autres; chaque '*limite*' est '*l'égal*' (τὸ ἴσον) de l'autre⁸⁴.

D'où la thèse exposée dans les pages que l'on vient de lire. Epicure ne mentionne pas le nom de Platon, pas plus qu'il ne mentionne celui d'Aristote (ainsi doit s'expliquer le ἴσως de Simplicius, quand il voit dans la théorie d'Epicure une réponse aux critiques qu'Aristote adressait aux atomistes⁸⁵). Le terme '*égal*' dont il fait usage quand il parle de sa nouvelle théorie des '*limites*' de l'atome est toutefois le même que celui qu'emploie Aristote quand il parle des triangles '*subélémentaires*' dans la théorie de Platon⁸⁶. Pour Platon comme pour Epicure, les composants ultimes de l'univers—qu'il s'agisse des triangles '*subélémentaires*' du *Timée* ou des '*limites*' de l'atome dans la *Lettre à Hérodote*—seraient donc '*égaux*'.

Cette '*égalité*' permet d'envisager la possibilité d'une influence. L'égalité des triangles est-elle à l'origine de l'égalité des '*limites*'? L'innovation d'Epicure est-elle tributaire de l'Académie?

⁸¹ Bailey (1926) 33 et 35 (traduction anglaise des chapitres 55 à 59 de la *Lettre à Hérodote*). Le même auteur met sous forme d'intitulé à son commentaire sur ces chapitres (p. 204) '*Parts of the atom*'.

⁸² Bailey (1926) 35 (cf. *Ep. ad Her.* 58).

⁸³ Bailey (1926) 209.

⁸⁴ Bailey, (1926) 25, traduit de la même façon ('*like*') le mot ὅμοιοι (cf. *Ep. ad Her.* 45). Les deux mots, ἴσος et ὅμοιος, ne sont toutefois pas synonymes.

⁸⁵ Simpl. *Phys.* 925.18.

⁸⁶ Epicur. *Ep. ad Her.* 58 (τὸ ἴσον). Aristot. *De cael.* III 2. 308b9 et 34 (ἴσων).

DEMOCRITE AU LYCEE: LA DEFINITION

ANNICK JAULIN

Si l'étude de la réception aristotélicienne de la physique abdéritaine a largement retenu l'attention,¹ on s'est moins attaché à l'intérêt épistémologique et logique manifesté par Aristote pour certaines thèses démocritéennes qu'il adapte à sa propre conception de la définition. Il est vrai que, dans le domaine de la théorie de la connaissance, le débat centré surtout autour de la question de savoir si Démocrite était 'un précurseur direct du scepticisme' ou 'un philosophe fondamentalement rationaliste'² retient en premier lieu le rapprochement effectué par Aristote entre Démocrite et Protagoras.³ Ce qui n'est pas une appréciation positive. Il est pourtant un aspect de la réception de Démocrite par Aristote qui donne lieu à une reprise consistante: la thèse des différences, réutilisée dans la théorie aristotélicienne de la définition.

Sans chercher à 'retraduire la traduction'⁴ qu'a effectuée en son propre langage le fondateur du Lycée, on ne peut considérer comme négligeable le fait que les différences démocritéennes, selon la transcription aristotélicienne: la figure (σχήμα), l'ordre (τάξις), la position (θέσις),⁵ se trouvent traduites et évoquées positivement en *Met.* H 2 (1042b11–15) dans le contexte de la théorie aristotélicienne de la définition. Dans la mesure où, dans ce même contexte, les différences sont présentées comme ce en quoi 'il faut chercher les causes de l'être' (1043a3), on peut même poser que la théorie aristotélicienne de la définition propose une transcription originale de l'*aitiologie* démocritéenne, puisqu'on le sait: 'il ne faut pas en effet se contenter dans l'énoncé d'une défi-

¹ Voir Morel (1996).

² Les expressions sont de P.-M. Morel (1998) 145.

³ Aristot., *Met.* Γ 5, 1009b11–12.

⁴ L'expression est de J. Bollack (1980) 12.

⁵ A vrai dire la thèse est d'abord présentée comme commune à Leucippe et Démocrite. Le témoignage d'Aristote est édité par DK dans les textes relatifs à Leucippe 67 A 6. Quand Aristote reprendra le même thème des différences en *Met.* H 2, il sera seulement question de Démocrite.

nition, d'exprimer un fait comme c'est le cas dans la plupart des définitions: il faut aussi que la cause y soit présente et rendue manifeste'.⁶ C'est donc à l'*aitiologie* démocratéenne qu'il faudrait référer la méthode aristotélicienne en matière de définition. Démocrite, plus que Platon, serait ainsi, pour la question de la définition, l'interlocuteur privilégié d'Aristote. L'absence d'une théorie de la définition chez Platon est d'ailleurs soulignée, lorsque dans la *Poétique*,⁷ est récusée la thèse selon laquelle le discours minimal serait constitué d'un nom et d'un verbe, ce qui est la thèse de l'Etranger du *Sophiste*. D'une certaine manière, on a depuis longtemps reconnu qu'Aristote trouvait certaines analyses démocratéennes préférables à certaines analyses platoniciennes, mais on a limité cette préférence aux 'raisons physiques', à la manière de Benoît Pereira dans son commentaire de la *Physique* qui fonde cette préférence sur le fait que Démocrite usait 'de raisons physiques' alors que Platon n'employait que des 'raisons logiques'.⁸ Ce jugement de B. Pereira est fondé sur certaines remarques du traité *De la génération et de la corruption*⁹ qui jugent la théorie démocratéenne des indivisibles corporels plus apte que la théorie platonicienne des surfaces planes indivisibles à expliquer l'existence des qualités sensibles telles que la couleur par exemple. Il s'agit déjà, dans ce cas, d'une reprise des trois différences démocratéennes, mais elles sont cependant envisagées selon une perspective limitée: leur capacité à rendre compte des qualités sensibles. Or, limiter les différences démocratéennes à cet usage physique ne permet pas de mesurer toute leur importance dans la théorie aristotélicienne. Car l'intérêt d'Aristote pour la thèse démocratéenne des différences ne se limite pas au domaine physique, mais trouve son plein développement dans une théorie logique, la théorie de la définition, qui s'exprime dans les analyses centrales des traités métaphysiques. Cette réception logique positive est d'autant plus remarquable qu'elle coexiste avec les critiques physiques bien connues adressées à l'atomisme. Ainsi l'image de Démocrite transmise par les textes aristotéliens est fortement contrastée, selon qu'elle est issue des traités métaphysiques ou des traités physiques. Il est cependant indéniable que l'inscription de la théorie aristotélicienne de la définition dans une lignée démocratéenne

⁶ Aristot., *De an.* II 2. 413a13-16.

⁷ Aristot., *Poet.* 20. 1457a24-26. Ce point est souligné dans le commentaire de R. Dupont-Roc et J. Lallot (1980).

⁸ Cette information est donnée par E. Mehl, dans Mehl (2001) 212 n. 3.

⁹ Aristot., *De gen. et corr.* 315b28-316a14.

est le signe le plus ferme de la haute estime en laquelle Aristote tenait, de manière générale, la méthodologie démocratéenne.

Après avoir brièvement évoqué les témoignages positifs relatifs à la méthode démocratéenne, on se concentrera ensuite sur les affirmations du rôle précurseur de Démocrite dans le domaine des définitions, on montrera enfin comment la théorie aristotélicienne de la définition s'inscrit profondément dans une lignée dont Démocrite est l'ancêtre, ce dont pourrait témoigner d'ailleurs l'expression *ἀτομον εἶδος*, qui marque l'épuisement des divisions ou différenciations possibles du genre premier.

Les assertions positives sur la méthode démocratéenne sont nombreuses et peuvent coexister avec des critiques ponctuelles ou de contenu. Un exemple parmi d'autres de cette situation, mais particulièrement significatif, est un passage du *De gen. et corr.* (315a34–315b1):¹⁰

‘d’une façon générale, personne ne s’est intéressé à ces questions autrement que d’une manière superficielle, sauf Démocrite. Celui-ci semble avoir réfléchi sur toutes les questions (*περὶ πάντων φροντίζειν*), mais se distinguer dès lors par le ‘comment’ (*ἐν τῷ πῶς διαφέρειν*)’.

Cette assertion de l’aspect profond et complet de la réflexion démocratéenne est suivie d’une explication de la différence entre les théories superficielles des autres et la théorie atomiste, qui met en évidence la carence de l’explication causale des autres doctrines et la recherche du ‘comment’, à l’inverse, dans la doctrine atomiste. Même si Aristote ne suit pas les explications causales de type démocratéen, il rend hommage à Démocrite d’avoir recherché ce type d’explications, au lieu de s’être contenté de répéter les banalités de ses contemporains. Avec Démocrite, un débat sur le ‘comment’ est possible.

Ce n’est pas le seul passage où l’originalité des thèses de Démocrite est soulignée, par comparaison avec les thèses de ses contemporains. On retrouve une assertion semblable en 323b10,¹¹ où Démocrite est dit être le seul à avoir formulé une vue personnelle. Plus loin (324b35–325a2),¹² à propos de l’action et de la passion, Démocrite et Leucippe sont décrits comme ayant proposé l’explication la plus économique et la plus conforme à la réalité des choses ‘en expliquant tous les phénomènes au moyen d’un seul raisonnement et en adoptant le prin-

¹⁰ 68 A 35 DK.

¹¹ 68 A 63 DK.

¹² 67 A 7 DK.

cipe qui est donné par la nature'. Les méthodes démocritéennes sont donc déclarées originales en regard de celles des contemporains. Non seulement elles sont originales, mais elles manifestent un souci et une recherche de l'explication, là où d'autres se contentent de la description des phénomènes. Démocrite se trouve ainsi être le seul à avoir 'réfléchi' de manière si large qu'Aristote semble ne devoir ajouter aucun domaine à ceux que son prédécesseur a considérés (tel est le sens de 'toutes' les questions). Bien que l'on se trouve dans un contexte physique, l'éloge est plus global puisqu'il porte sur la méthode ou l'explication (λόγος) démocritéennes. Le *logos* démocritéen est donc pris régulièrement en considération par Aristote, même s'il ne partage pas le contenu des explications proposées par ce *logos*.

Cet éloge méthodologique général se concentre sur un point beaucoup plus précis, à savoir la théorie de la définition et la saisie du τὸ τί ἦν εἶναι. Les textes ici sont ceux de *Met.* M 4 (1078b20)¹³ où Démocrite est cité, entre Socrate et les pythagoriciens, comme l'un de ceux qui ont 'touché' (ἥψατο)¹⁴ 'à une petite partie (ἐπὶ μικρόν) de la Physique, ne définissant guère que le chaud et le froid' (1078b19–21, tr. Tricot). La spécificité démocritéenne semble bien résider dans les définitions physiques, puisque Socrate est explicitement rattaché aux définitions éthiques et les pythagoriciens à la réduction des définitions aux nombres, tandis que Démocrite aurait défini le chaud et le froid. Outre le caractère physique des exemples proposés, on doit souligner leur présentation en forme de couple de contraires.

Une autre allusion à cette même avancée démocritéenne dans le domaine des définitions se trouve dans deux textes de la *Physique*:

- En *Phys.* II 2. 194a20–21,¹⁵ Démocrite, en compagnie cette fois d'Empédocle, est dit encore avoir 'touché' (ἥψατο) à la forme et à l'être essentiel (τὸ τί ἦν εἶναι)', contrairement aux Anciens qui auraient pu laisser croire que le physicien s'occupait seulement de la matière.
- En *Phys.* I 5. 188a22–26,¹⁶ Démocrite a droit à une mention spéciale dans la liste de ceux qui ont posé les contraires comme principes, puisque de nouveau les trois différences démocritéennes

¹³ 68 A 36 DK.

¹⁴ Le verbe est fréquent s'agissant de Démocrite.

¹⁵ Le fragment n'est pas édité par DK.

¹⁶ 68 A 45.

sont décrites comme ‘des genres de contraires’. On sait que les contraires sont les formes dans les traités physiques. Il faudra, en outre, mettre en rapport ces genres des contraires avec les ‘genres des différences’ en *Met.* H 2 et la problématique de la définition qui en découle.

Le rapprochement entre Empédocle et Démocrite est instructif, car il permet de développer ce qui autrement resterait implicite et obscur dans son contenu. En effet, deux autres passages, l’un dans le *Traité de l’âme*, l’autre dans la *Métaphysique* (A 10. 993a17–18), explicitent de quelle manière Empédocle a ‘touché’ au τὸ τί ἦν εἶναι: ‘ce n’est pas un état quelconque des éléments qui constitue chacun des composés, mais une certaine proportion et composition (λόγῳ τινὶ καὶ συνθέσει)’ (*De an.* I 5. 410a1–3), or cette proportion, ce *logos*, est précisément ce qui est le τὸ τί ἦν εἶναι et l’οὐσία de la chose en question. Tout manifeste que les différences démocritéennes sont l’équivalent de la proportion (le *logos*) empédocléenne, et que c’est par elles que Démocrite a touché à la définition et à l’être essentiel. De nouveau la référence à Démocrite implique une appréciation positive dans le domaine du *logos*: qu’il s’agisse des explications générales ou de la définition, la manière démocritéenne se signale par sa recherche de raisons.

On peut trouver une forme de synthèse entre le témoignage de la *Métaphysique* et celui de la *Physique* dans le traité des *Parties des Animaux* (*De part. an.* I 1. 642a18–31)¹⁷ où se trouvent réunis Empédocle (au lieu des Pythagoriciens qui figuraient dans le texte de *Métaphysique* M), Démocrite et Socrate dans un accès progressif à la définition et à la saisie de l’essence. C’est, en effet, sous un argument qui affirme que ‘la nature est principe plutôt que la matière’ (642a17) que sont évoqués ces trois noms. Certes il s’agit d’un accès progressif à la saisie de l’essence, non conscient de lui-même et ‘entraîné par la chose même’, sans que ces auteurs aient vu la nécessité pour la science physique de la saisie de l’être essentiel et de l’ousia. Telle est la raison pour laquelle Aristote affirme qu’ils ont seulement ‘touché’ à cette question. Malgré tout, en ce domaine, Démocrite fait figure de premier inventeur, puisqu’il est donné (642a26–27) comme le ‘premier’ à avoir cherché à définir l’être essentiel. Socrate est dit, ici comme dans le texte des traités métaphysiques, avoir détourné ‘vers les vertus utiles et la politique’ la recherche des définitions. Le rapprochement opéré entre

¹⁷ 68 A 36.

Démocrite et Empédocle d'une part, Démocrite et les Pythagoriciens d'autre part, manifeste la constance du jugement aristotélicien relatif à Démocrite, puisque Empédocle peut être décrit comme un 'ami du pythagorisme'.¹⁸ Ce qui ne veut pas dire que Démocrite est pythagoricien, mais qu'il est *comme* eux, ou qu'il leur ressemble. La raison de cette ressemblance est explicitée par Aristote: la thèse atomiste qui pose les premières grandeurs comme indivisibles et infinies en nombre revient en réalité, pour Aristote, à traiter les grandeurs comme des nombres (*De cael.* 303a8–10), de sorte que même si les atomistes 'ne l'indiquent pas clairement, cependant ce qu'ils veulent dire' est fort proche de ce que disent clairement les pythagoriciens. La proximité entre Démocrite et les pythagoriciens est un élément constant de la question de la définition, puisqu'elle caractérise également la reprise aristotélicienne de la question en H 2, où sont nommément cités Démocrite et Archytas. Cette proximité et l'argument sous lequel elle est présentée dans les *Parties des animaux* selon lequel 'c'est la nature qui est principe plutôt que la matière' invitent à douter qu'Aristote ait considéré Démocrite comme un penseur matérialiste.

L'intérêt manifesté par Aristote pour les thèses démocritéennes qui concernent la définition et la saisie de l'essence se manifestent au mieux dans sa reprise de la théorie des différences, sur laquelle il appuie sa propre théorie de la définition. On ne saurait limiter l'intérêt aristotélicien pour cette théorie à une simple description d'opinions. En effet la thèse des différences n'apparaît pas simplement au livre A de la *Métaphysique* dans le contexte de l'exposé des opinions antérieures relatives aux causes. Le texte central est ici celui de *Met.* H 2,¹⁹ où l'on voit Aristote évoquer la théorie des trois différences démocritéennes: figure, position, ordre (1042b11–15), qui viennent informer le corps substrat, puis illustrer cette théorie par des exemples. L'exemple le plus évident est celui du seuil qui est tel non par la pierre qui en constitue la matière, mais par la position de la pierre qui fait de cette pierre un seuil et rend raison de ce par quoi la pierre est un seuil (1042b19–20). Aristote reprend à son compte cette théorie des différences en la généralisant il affirme que les différences sont en plus grand nombre que les trois citées par Démocrite (1042b15–25) pour conclure que 'être' se dit en autant de sens qu'il y a de différences: 'en conséquence il

¹⁸ La formule est de J. Barnes (1997).

¹⁹ Le texte n'est pas dans DK.

est clair que “est” se dit en autant de sens’ (1042b25–26). Ce qui est immédiatement montré par une suite d’exemples (1042b26–31). Si l’on reprend l’exemple du seuil, la manière dont l’être du seuil est défini par une différence est exposée ainsi: ‘Car un seuil est seuil parce qu’il est placé de telle façon et “être un seuil” signifie être placé de cette façon’. Il faut remarquer la formulation de la thèse et l’insistance sur la ‘façon’ (οὕτως). L’adverbe de manière donne un exemple précis, dans le domaine des définitions, de la méthode générale de Démocrite dont l’originalité, relevée par Aristote, réside dans un intérêt pour le ‘comment’ (πῶς). Les différences disent la cause dans le domaine des définitions, comme la suite du texte le montre, ce qui permet d’affirmer qu’il s’agit bien d’une démarche *aitiologique*.

En effet, la suite des exemples débouche sur une règle générale qui constitue une déontologie de la définition: ‘Il faut donc saisir les genres des différences (car ils seront les principes de l’être)’ (1042b32–33). La manière de regrouper les différences sous des genres donne lieu de nouveau à une série d’exemples: ainsi le dense et le poreux comme le plus et le moins sont regroupés sous le genre de l’excès et du défaut, de même la figure comme le lisse et le rugueux sont rangés sous le genre du droit et du courbe (1042b33–36), les genres des différences sont des contraires. Ces genres contraires sont donnés comme ‘la cause de l’être’ (1043a3) de chacune des choses envisagées qui ne sont pas des substances ils sont ainsi l’analogue de l’*ousia* pour les substances. Dans la mesure où le contexte du livre H expose la thèse de la matière comme *dynamis* et de la forme (εἶδος ou οὐσία au sens premier) comme *energeia*, cette analogie entre l’*ousia* au sens premier et les différences fait des différences des éléments formels, expressions de l’*energeia*. La fonction des différences est l’expression de l’*energeia* (de l’acte), puisque ‘comme, dans les substances, le prédicat de la matière est l’être en acte—même, il l’est aussi au plus haut point dans les autres définitions’ (1043a5–7), où l’on retrouve la définition du seuil, comme une pierre ‘ainsi disposée’. Ce qui se conclut par l’affirmation explicite que ‘la définition par les différences est définition de la forme et de l’être en acte’ (1043a19–20), tandis que la définition par les éléments constitutants est définition de la matière. Si la théorie démocratéenne des différences est associée à la théorie aristotélicienne de l’être en acte, on peut en conclure qu’elle est l’objet d’un jugement positif qui justifie son intégration à un élément central de la doctrine aristotélicienne. La fin du texte confirme la constance de la proximité entre Démocrite et les pythagoriciens sur ce point, puisque le texte se termine sur une

référence à Archytas (1043a21–26) dont la manière de concevoir les définitions est donnée comme semblable à celle qui vient d’être exposée (1043a21–22).

Le thème ainsi engagé est riche en prolongements puisqu’il concerne la conception même de l’être. Sans pouvoir épuiser ici la richesse des conséquences, on peut dégager le schéma de la reprise aristotélicienne de la théorie des différences démocritéennes: elle concerne la bonne formation de l’énoncé de définition qui doit donner la cause. Cette thèse est liée à une certaine manière de concevoir le rapport de la matière et de la forme dans la théorie de l’*ousia* et de son *logos*, où la forme et la matière dernière sont identiques. Ce qui est d’ailleurs la conclusion des dernières lignes du livre H (1045b17–23). Ce thème est celui de l’état accompli (ou ἐντελέχεια) de la différenciation d’une matière initiale. C’est à ce rapport de différenciation de la matière par la forme que s’opposerait la conception d’un rapport additif entre la matière et la forme, évoquée plus loin en H 3 (1043b4–8): la syllabe n’est pas une addition des lettres plus la synthèse, comme si la matière et la forme pouvait exister, en acte, séparément l’une de l’autre car la synthèse ou le mélange modifie les éléments dont il y a mélange ou synthèse. Ainsi que le seuil soit tel par sa position manifeste qu’on ne peut réduire la forme de la syntaxe à l’addition des éléments, simplement parce que AB n’est pas BA, l’exemple est celui qui a servi à exposer, au livre A (985b18), la différence d’ordre dans la théorie démocritéenne. L’ordre qui est l’un des modes de la forme, ou l’une des différences, est irréductible aux composants élémentaires qu’il différencie dans le lien (ou le *logos*) qu’il établit entre eux les composants élémentaires n’ont aucune autonomie, sauf analytique, en dehors de ce lien. Tout le chapitre 17 de *Métaphysique Z* expose la même idée en montrant comment la forme est cause pour la matière de ce qu’elle est. Ce rapport de la matière et de la forme est celui qui ne peut se penser comme le rapport d’une monade à une autre monade ou d’un point à un autre point (H 4. 1044a8–9). Les assertions de Démocrite servent également, en Z 13,²⁰ à fonder la critique de la théorie platonicienne des idées et à illustrer l’impossibilité de constituer un énoncé de définition si l’on conserve une théorie substantielle, c’est-à-dire atomique, de l’idée. C’est avec raison, reprend Aristote, que Démocrite affirme que l’on ne saurait produire le deux à partir de l’un ou l’un à partir du deux, dans une logique

²⁰ 68 A 42 DK.

atomique ou monadique (1039a7–11), ou encore qu'une substance ne saurait être composée de substances. Cette remarque critique pourrait valoir contre la théorie atomiste elle-même, mais pas plus que contre toute forme d'atomisme élémentaire, qu'il s'agisse de l'atome démocritéen, du nombre pythagoricien ou encore de l'idée platonicienne.

Les différences ne sont donc pas des substances, mais des qualités de la substance (Δ 14. 1020a33–b 1). Telle est d'ailleurs la raison de la mention positive d'Antisthène en H 3 (1043b24) et de sa critique adressée à certaines théories de la définition (1043b24–28), assortie de l'affirmation corrélatrice de l'impossibilité de définir la substance (ou l'essence), s'il s'agit d'une monade ou d'une essence simple. De là l'affirmation qu'il y a définition des seules substances composées (1043b29–30). Que l'on puisse seulement dire la qualité ou la manière dont une chose se trouve être, trouve sa justification dans la reprise de la théorie des différences. On voit donc que c'est sur la théorie démocritéenne que se fonde l'accord, au demeurant assez limité, avec Antisthène. Au reste, Antisthène n'est jamais mentionné par Aristote comme prédécesseur éventuel dans la recherche ou la découverte éventuelle du $\tau\omicron\ \tau\acute{\iota}\ \tilde{\eta}\nu\ \epsilon\acute{\iota}\nu\alpha\iota$, alors que Démocrite, on l'a vu, figure parmi les prédécesseurs nommés. Démocrite et non Platon est donc l'ancêtre de la théorie aristotélicienne de la définition.

Le fait que l'on ne puisse constituer une substance avec des substances ou un composé quel qu'il soit avec des monades ou des atomes justifie, à l'inverse, que les traits caractéristiques de la définition d'une substance soient pensés comme des qualités ou des différences qui donnent forme à une matière substrat. Cette règle va fonder ce que l'on pourrait décrire comme un atomisme paradoxal d'Aristote. Si la matière dernière et la forme sont une seule et même chose, c'est que 'la dernière différence est la substance [ou l'essence] et la définition' (Z 12. 1038a19–20). Mais pourquoi cette différence est-elle la dernière? Elle l'est parce qu'elle ne peut plus être différenciée ou divisée, autrement dit parce qu'elle est indivisible, puisque l'on va de différence en différence jusqu'aux *adiaphora* (1038a16). Or le niveau de l'indivisible est celui de l'*atomon eidos* et arriver à la dernière différence est 'arriver aux atomes' (1058a20).

On espère avoir montré l'importance de la théorie des différences démocritéennes pour la conception aitiologique de la définition que revendique Aristote. Cette conception implique directement qu'il est superflu de supprimer la matière pour définir, même si les parties de

la définition sont les parties formelles. Aristote introduira à cette fin, en Z 12, la thèse du genre comme matière pour les différences et posera que 'la définition est l'énoncé (λόγος) issu des différences (ἐκ τῶν διαφορῶν)' (1038a8–9). Ce thème, qui est l'un des thèmes principaux du livre Z, notamment Z 10 et 11 (1036b25), conduit à l'idée qu'il n'est pas possible de définir autre chose que les substances composées (1043b28–32), et qu'il n'y a pas de définitions des éléments simples et premiers (1041b9–11). Ce qui revient à dire que les substances physiques qui sont composées sont celles qui sont susceptibles, au premier chef, de recevoir une définition. La théorie démocritéenne des différences est l'ancêtre de cette théorie de la définition. Cette théorie implique l'assertion de l'existence de formes et d'un ordre dans le monde des substances composées. Que la tradition du Lycée ait été réceptive à cet aspect de la théorie de Démocrite est ce dont témoigne une allusion elliptique de Théophraste, jugée d'ordinaire obscure, à la fin de sa *Métaphysique* (11b21–23): l'atomisme est l'une des premières assertions de l'existence de formes d'ordre dans le monde physique, formes d'ordre qui ne concernent pas uniquement les corps célestes. Cependant, même si l'atomisme est la forme la plus aboutie du discours physique et s'il cherche des formes et des définitions sans ramener les objets physiques à des objets mathématiques, comme le font les pythagoriciens, malgré tout il n'échappe pas à un atomisme monadique ou élémentaire qui suscite des difficultés pour penser les totalités organiques. Aristote lui substitue ce que l'on pourrait nommer un atomisme du complexe. L'atomisme du complexe n'est pas une contradiction dans les termes: on peut concevoir l'atome comme l'indivisible, mais cet indivisible est non un élément premier en deçà duquel on ne peut poursuivre la division, mais l'élément dernier que l'on ne peut enrichir d'une division ou d'une détermination supplémentaire, celui que l'on ne peut différencier davantage cet atomisme est celui de la 'dernière différence' (1038a19–20).

La différence entre les deux formes d'atomisme n'est cependant pas négligeable. Entre les deux, ce qui est en jeu est l'absence ou la présence d'une nature. Selon Aristote, Démocrite avec ses rencontres d'atomes dues au hasard est, comme Empédocle, incapable de penser une nature. La pensée aristotélicienne de la nature implique, elle, la répétition d'une différenciation progressive et constante: la répétition d'un même programme de différences données par là même comme essentielles. Cette divergence explique les critiques de l'atomisme dans le domaine physique. Mais Démocrite, comme Empédocle, et mieux

qu'Empédocle donne les premiers rudiments d'une théorie de la syntaxe des différences qui est aussi une théorie du logos, d'où l'éloge méthodologique et logique qui lui est régulièrement adressé. Ainsi il y a un désaccord avec Démocrite dans la définition de la *physis*, mais accord dans la constitution des formes du logos et des énoncés de définition. La théorie des différences est une théorie des formes, celle qui suscite les critiques minimales de la part d'Aristote. On doit en conclure que, pour Aristote, l'atomisme n'est pas un matérialisme et cesser d'interpréter les critiques qu'il adresse à cette théorie comme fondées sur cette raison supposée. Continuer de le faire serait projeter sur la conception aristotélicienne notre propre conception du matérialisme. Que telle ne soit pas la conception aristotélicienne de l'atomisme, la preuve en est fournie par la similitude des critiques adressées à l'atomisme, au pythagorisme et à la théorie des Idées. On peut, dans tous ces cas, parler de mécanisme, non de matérialisme. Ainsi, quels que soient les défauts de la théorie physique de Démocrite (notamment de sa cosmogonie), on ne saurait taire ses nombreux apports méthodologiques. La méthodologie démocritéenne, notamment sa théorie des différences, constitue l'*aitiologie* la plus valide que le Lycée puisse trouver dans les travaux des philosophes antérieurs. Démocrite est donné comme un prédécesseur dans la recherche du τὸ τί ἦν εἶναι.

OUT OF TOUCH: PHILOPONUS AS SOURCE FOR DEMOCRITUS

JAAP MANSFELD

1. *Introduction*

The view that according to Democritus atoms cannot touch each other, or come into contact, has been argued by scholars, most recently and carefully by C.C.W. Taylor, especially in his very useful edition of the fragments of the early Atomists.¹ I am not concerned here with the theoretical aspect of this issue, that is to say with the view that the early Atomists *should* have argued (or posthumously admitted) that atoms cannot touch each other because only the void that separates them prevents fusion. I wish to focus on the ancient evidence for this interpretation. Our only ancient source for this view happens to be Philoponus; to be more precise, one brief passage in his *Commentary* on Aristotle's *Physics* (fr. 54c Taylor) and two brief passages in that on Aristotle's *On Generation and Corruption* (54d and 54e Taylor ~ 67A7 DK). These commentaries, as is well known, are notes of Ammonius' lectures, with additions by Philoponus himself.

Bodnár has argued that this evidence is not good enough, because all other ancient sources, in the first place Aristotle, are eloquently silent on a ban on contact; what we have here therefore are 'guesses of Philoponus, which are solely based on the text of Aristotle'.² Taylor admits the force of this objection, but sticks to his guns: 'perhaps',

¹ Taylor (1997) 222, (1999) 186–188, 192–193, (1999a) 184, cf. the discussion in Kline and Matheson (1987) and Godfrey (1990). On the problems related to the assumption that attraction plays an important part see further the cautious remarks of Morel (1996) 422–424, who however does not take into account the passages in Philoponus which suggest that atoms cannot touch each other.

² Bodnár (1998) 45–51, esp. 49–50. Cf. Tarán (1969) 12: 'many times what Asclepius and Philoponus [in their commentaries on the *Introduction to Arithmetic*] quote or paraphrase from ancient authors is probably only based on the text of Nicomachus that Ammonius [cf. below, n. 8] must have had in front of him while he lectured'. Against Taylor see also Haspers (1999).

he says, the Atomists held that contact was impossible;³ moreover the implication (!)⁴ of Philoponus' contention, viz. that the "basic physical forces are attraction and repulsion", works quite well. There is also solid evidence that the principle of 'like to like' played an important part in Democritus' physics.⁵ Atomic motion, such as the formation of compounds consisting of atoms of the same shape and more or less the same size, may therefore be explained by attraction, and attraction also explains why they stay together.⁶

But how reliable is Philoponus as a source for Democritus, that is to say: what were his sources for Democritus' doctrines, and how did he use them? I have looked at all the references to the early Atomists in his genuine works. The outcome of this inspection is that he⁷ either did not have Democritus' works in the field of physics or at any rate did not bother to look things up in those works that may have been available. The fact that Simplicius, who is fond of quoting from Presocratic texts, does not do so for Democritus and Leucippus makes the conclusion that by the time of these late commentators the *corpus Democriteum* had been lost practically inescapable. The only kind of information on early Atomism used by Philoponus turns out to be what is found in the treatises of Aristotle, what (presumably, and as I shall argue) he was able to find in other commentaries on these treatises or what had percolated from these commentaries to his own days, and perhaps also what was to be found in the *Placita* literature. The unparalleled contention that atoms cannot touch each other is an exegetical manoeuvre, and one needs to look carefully at the contexts where it occurs. Most importantly, we shall find that elsewhere Philoponus also states that atoms *do* bump into each other.

³ Taylor (1997) 222, (1999) 187, (1999a) 184.

⁴ Philoponus does not mention either attraction or repulsion.

⁵ Cf. also below, section 5.

⁶ Taylor (1999) 187f., 193. That atoms when combined or entangled may stay together simply as long as no external force breaks up the combination is not taken into consideration. See the famous fragment from Aristotle's *On Democritus*, fr. 208 ³R (~ 44a Taylor, 68A37 DK) *ap. Simplicius in Cael.* 295.18–20: 'he thinks that the atoms hang on to one another and remain together for such an amount of time (ἐπὶ τοσοῦτον οὖν χρόνον σφῶν αὐτῶν ἀντέχεσθαι ... καὶ συμμένειν) until some stronger necessity from the surroundings thoroughly shakes the compound and disperses it'.

⁷ As well as his master Ammonius, to whom I shall refer no more: the name Philoponus is short for the commentaries on Aristotle that are at issue.

Certain odd statements to be found in his commentaries occasionally reveal a lack of interest in other than purely exegetical matters.⁸ Examples: at *in GC* 155.19–20 he has Parmenides introduce the Infinite (τῷ αὐτῷ τρόπῳ ὃ Παρμενίδης καὶ τὸ ἄπειρον εἰσήγεν κ.τ.λ.) At *in An.* 9.19–21 he quotes Empedocles' line that 'for humans the blood in the region of the heart is thought' (31 B 105.3 DK), attributing it to 'Critias, one of the Thirty' (~ 88A23 DK, second text).⁹ But at *in An.* 89.9–13 (~ 88A22 DK) he tells us a little more; commenting on Aristotle's remark at *An.* 405b5–8 (~ 88A22 DK, first text) that according to Critias the soul is blood, he states that Aristotle here refers either to 'one of the Thirty', or to another Critias, a sophist, but that this does not matter much. A commentary tradition must be behind the information about the two Critiases, for he adds 'they say there was also another Critias, who is the author of the writings that are available, as Alexander [of Aphrodisias] says'. The tyrant only wrote 'constitutions in verse'. This man is the one who said the soul is blood, for he says 'for humans the blood in the region of the heart is thought'. Clearly the line is quoted merely to explain the content of Aristotle's note about Critias, the historical background being irrelevant to the exegetical purpose. Philoponus' note on Critias is paralleled at [Simpl.] *in An.* 32.22–23, commenting on the same passage in Aristotle: 'the man who posited that the soul is blood, Critias, either was one of the thirty tyrants or some sophist; this (alternative) will be irrelevant for us'.

The pseudo-precise confusion between Critias and Empedocles is probably due to the fact that in the doxographical tradition and elsewhere the tenet that the soul consists of blood is sometimes attributed to both.¹⁰

⁸ On the 'careless scholarship' of Ammonius and his pupils see Tarán (1981) 731–734 with n. 31 = (2001) 494–497.

⁹ 'Irrtum d. Philop.' say DK *ad loc.*

¹⁰ Macrobius *in Somn.* 1.14.20 (part of a long list), *Empedocles et Critias sanguinem*. Gal. *PHP* 2.8.48 says that Diogenes (*SVF* III fr. 30), 'forgetting about the doctrines of his own school, says the soul is blood, as Empedocles and Critias believed' (αἷμά φησιν εἶναι τὴν ψυχὴν, ὡς Ἐμπεδοκλῆς καὶ Κριτίας ὑπέλαβον). These two texts are not in DK. See further Mansfeld (1990a) 3073 n. 48, 3077 n. 74, 3096 n. 149.

2. *Atomic shapes, and sense perception*

We may next look at some representative passages dealing with Early Atomism. On the shape of the atoms: at *in Ph.* 228.28–229.2 (~ 43c Taylor), Philoponus says that fire atoms are spherical, and that water happens to consist of cubical atoms. At *in GC* 12.31–13.2 (cf. *ad* 43c Taylor) he again says that fire atoms are spherical, but now attributes the cubical atoms to earth. At *in Ph.* 162.26–27 he says that among the infinitely many atoms each shape is to be found, e.g. the spherical and the cubical and each of the other shapes. The point about fire derives from Aristotle and so apparently could not be modified,¹¹ but Philoponus naturally had no information on the atomic shape of the other traditional elements.¹² His exegetical improvisation about the cubical shape of water atoms is peculiar, especially when set off against his later explanation that it is earth that consists of cubelets, a view clearly indebted to Plato's account of the stereometric structure of earth corpuscles (*Ti.* 55d–56a).

Earlier in the *in Physica* we find a longer passage dealing with atomic shapes, *in Ph.* 25.21–26.8 (for understandable reasons not in our collections of Democritean fragments). Philoponus here explains the words 'or even contrary' (*Ph.* 184b22) in Aristotle's fundamental diaeretic account of the principles (*archai*) of his predecessors. He suggests that these may pertain to Democritus, who, he says, posited that the atoms were one in kind but different in shape, and not only different but 'even contrary'. Spherical atoms because of their swiftness are the cause of fire and of our perception of heat, whereas, e.g., cubical atoms, because pushing and compressing, produce our perception of cold:

He [sc. Democritus] said that the same thing happens with colours; when for instance the points of pyramids bump into the eye [or: optic beam, *πρὸςβάλλουσι τῇ ὀψει*] they produce a specific impression of colour;

¹¹ Arist. *An.* 403b31–404a3 (~ 106a Taylor, 67A28 DK; cf. also Arist. *An.* 405a11–13 ~ 107b Taylor, 68A101 DK), and Philoponus' comments, *in An.* 67.11–14, 67.28, 68.13–14, 84.12–20. See e.g. Morel (1996) 137ff., Salem (2002) 187ff. Cf. below, n. 12.

¹² Arist. *Cael.* 303a12–16 (~ 54a Taylor, 67A15 DK) states that Leucippus and Democritus failed to define the shape of each element except that of fire, 'to which they assigned the sphere; air and water and the rest they distinguished by greatness and smallness'. Alexander, cited by Simplicius *ad loc.*, hypothesizes that air according to them consisted of smaller corpuscles of the same shape, water of bigger, and earth of even bigger corpuscles (Simpl. *in Cael.* 610.24–28 ~ 54b Taylor). Cf. *in Cael.* 617.22ff., 625.1–3, where Simplicius himself says that according to Democritus air, water and earth differ in respect of the smallness of their elements, which are of the same shape.

e.g. of white, for what dilates the eye [or: optic beam] is white; and what is piercing, such as the point of the pyramid, dilates as well. When the bases [of the pyramids—and the faces of the cubes (?)]—come into contact with the eye (or: optic beam), they produce the colour] of black; for black is contracting, and this nature belongs to the blunt too, for it contracts and by this contraction pushes what is distant [from each other] to the same [place].

Compare, later in the same work, in the comments on Aristotle's views about chance and spontaneity (*Ph.* 195b30–198a1) at *in Ph.* 262.17–19, the following statement:

in his account of particular processes, such as why warm things dilate, and white things,¹³ or why honey is sweet, he [sc. Democritus] posits as causes the position and arrangement and shape of the atoms.¹⁴

We happen to know, from a text either not available to or neglected by Philoponus, that Democritus' explanation of white and black was different. Theophrastus tells us, *Sens.* 73–74, that according to Democritus 'what is smooth is white', while 'black is composed of the very opposite shapes, viz. rough, irregular and dissimilar shapes'.¹⁵ Philoponus' account is entirely based on Plato's doctrine of perception, and in particular on that of the perception of colour at *Ti.* 67c–68b. The formula 'what dilates the eye [or: the optic beam] is white' (διακριτικὸν γὰρ τῆς ὀψεως τὸ λευκόν) for instance is a virtually verbatim quotation of *Ti.* 67e6, τὸ μὲν διακριτικὸν τῆς ὀψεως λευκόν. The 'sharpness' which 'dilates' (διακριτικὸν δὲ καὶ τὸ ὀξύ) echoes Plato's ὀξύτεραν φορὰν [...] καὶ διακρίνουσαν, *Ti.* 67e6–7; for the sharpness of the pyramids of fire see *Ti.* 61e1–62a1. The compression by what is black is also precisely paralleled, viz. at *Ti.* 61e6–7, cf. 67d6.

Plato's theory is correctly reproduced Thphr. *Sens.* 86, 'what disintegrates (the organ) is white; what reintegrates it is black—a contrast analogous to hot and cold in the case of flesh, and to astringent and pungent in the case of the tongue.' See also Galen, *Synops.* xvi.8–9, *alba corpora visum disiungunt, nigra autem coniungunt*.

Clearly, for Philoponus Plato's theory of colour is the only one. Yet his a-historic account serves its purpose rather well, viz. to explain Aristotle's formula 'or even contrary' as being about the atoms of Democritus.

¹³ Wrong transl. Lacy (1993) 73; better at his footnote 478.

¹⁴ For position, arrangement and shape see below, text to n. 19.

¹⁵ 113 Taylor ((1999) 115–116) ~ 68A135 DK.

We should however note that this interpretation of the formula is not original but indebted to the commentary tradition. Simplicius informs us, in *Ph.* 43.24ff., about a traditional debate among exegetes: Porphyry and Themistius believed the words ‘or even contrary’ are about Anaxagoras, while Alexander of Aphrodisias, who already knew this interpretation, believed the whole phrase in Aristotle, and so this formula as well, to pertain to Democritus. Accordingly, Philoponus, though he does not say so, sides with Alexander part of the way. Further evidence for his indebtedness to the tradition in this case is another passage in the same work of Simplicius, in *Ph.* 36.1–7 (~ 247 Luria). Here we are told that Leucippus and Democritus held that the shapes, position and arrangement of atoms produce warm objects when these are composed of sharper and finer and equally arranged particles, and cold and watery objects when these are composed from contrary particles, and that—clearly for the same reasons—some compounds are radiant and clear, others dark and murky. This is rather close to Plato on black and white, and one is inclined to believe either that Philoponus made more explicit what he found in the commentary or commentaries that was/were his source, or came upon a more explicit account already in one of his predecessors. For the influence of the tradition compare for instance Simpl. in *Cat.* 107.7–9 about contraries, with its echo of the *Timaeus* passage cited above as the ultimate source for Philoponus on colours: ‘white and black are contraries; the one is a colour which dilates (or: segregates, dissociates) the eye (or: the optic beam: διακριτικὸν ὄψεως), the other a colour which compresses (or: aggregates, associates: συγκριτικόν)’. For this standard conception see also e.g. Phlp. in *Ph.* 92.13–14, on white as segregating (διακριτικόν) and black as aggregating (συγκριτικόν).

As to hot and cold, Thphr. *Sens.* 63 states that Democritus held that our perception ‘changes according to a change of shape’ (τὸ σχῆμα μεταπίπτον); in other words, he held that different shapes produce different sensations. Information about this view percolated to the commentary literature, for Simplicius quotes, not the *de Sensibus*, but the *Physics*¹⁶ (Thphr. fr. 238 FHS&G ~ 130 Taylor, 68A120 DK), for the view that hot and cold should be explained by having recourse to the atoms, in *Cael.* 564.24–26.¹⁷ So Philoponus’ various attempts to distribute dif-

¹⁶ Yet the text was included by Diels among the remains of the *Physicorum Opiniones* (fr. 13).

¹⁷ Cf. Morel (1996) 209, 367.

ferences of shape over the atoms of the traditional elements may have been inspired by the sort of information preserved by Simplicius in the passage cited, though Aristotle, as we have noticed, already remarked that Democritus did not posit differences of shape for the atoms of air, water and earth.¹⁸

Themistius' point of view at *in Ph.* 2.31–3.2, which is indeed clear from his paraphrase of this passage of Aristotle's *Physics* on the principles (*archai*), is also interesting in another respect. For the contraries Themistius attributes to Anaxagoras are roughly the same as those attributed to Democritus by Philoponus and Simplicius, namely 'hotnesses and coldnesses, whitenesses and blacknesses'. It is quite likely that these examples in our late sources are ultimately inspired by the section in the *Categories* dealing with contraries, for among the first examples of contrary qualities listed by Aristotle are the hot as one of a pair, and white and black (*Cat.* 13a20–21).

It is hard to believe that Philoponus could have believed that these interactions between sense organs (or instruments of sense perception) and objects as perceived were a matter not of contact but of attraction and repulsion.

3. *Efficient (or 'productive') and motive causes*

Explaining Aristotle's remark (*GC* 322b6–8) about the use of aggregation (or association, compression) and segregation (or dissociation, dilation) and of action and passion by those philosophers who make the elements come to be, as well as by those who make the things derived from the elements come to be, Philoponus at *in GC* 127.17–22 briefly discusses Empedocles, Anaxagoras and Democritus. The efficient causes of these processes according to Empedocles are Strife and Love, for Anaxagoras Intellect (note that this is a paraphrase of Arist. *Ph.* 265b19–22). I quote the section on Democritus:

And for that matter according to Democritus too shape, arrangement and position would be productive causes (ποιητικά αἴτια—Williams *Phlp.* translates 'efficient'), and in addition chance and spontaneity (ἡ τύχη καὶ τὸ αὐτόματον).

¹⁸ Above, n. 12.

For shape, arrangement and position as causes according to Aristotle see *Metaph.* 985b14–15 (~ 46a Taylor, 67A6 DK) on these differences in the atoms as the causes (αἰτίας) of all other qualities.¹⁹ And for Aristotle's views on 'chance and spontaneity' see the long discussion at *Phys.* 195b31–198a1, with *inter alia* its references to what must be the views of the Atomists. According to Aristotle some people were mistaken in arguing that cosmogony is the outcome of chance and spontaneity, while processes in a cosmos such as those leading to the generation of living things are not fortuitous (*Ph.* 196a24–31 ~ 71a Taylor, 68A69 DK). Philoponus elaborates on this view in his comments on this passage, see esp. in *Ph.* 261.31–263.2; he concludes by stating that by his wrongheaded approach Democritus in fact entirely fails to give us an explanation²⁰ of chance and spontaneity (οὐδένα λόγον ἡμῖν περὶ τύχης καὶ αὐτομάτου κατεβάλλετο).

It would seem that Philoponus in the other passage (in *GC* 127.17–22) cited above merely combines these two types of causes: first examples of necessary ones, then fortuitous ones. A comparison of these two passages betrays his exegetical opportunism, or ad-hoc-ism. We may further note that the attribution of chance and spontaneity as causes to Democritus is also found in the doxographical tradition. Aëtius 1.29.7 Diels (at both ps.Plutarch and Stobaeus) attributes to Anaxagoras and the Stoics the view that 'chance is a cause inscrutable to human reasoning; for some things are according to necessity, others according to fate, others according to choice, others according to chance, and others according to spontaneity' (τὸ αὐτόματον again). The paraphrase of Aëtius by Theodore, *CAG* 6.15 (~ 72 Taylor), adds the name-label Democritus to 'Anaxagoras and those from the Stoa' (at 59A66 DK these two versions have been coalesced!). So Democritus already figured in the Aëtian lemma (unless one assumes that Theodore added the name-label, which is unlikely). This Theodorotean/Aëtian attribution to Democritus will in the final resort be an echo of Aristotle's discussion at *Ph.* 195b30ff. cited above.²¹

It is neither possible nor very important to find out what precisely was Philoponus' source for the concluding section of his list, for the commentary tradition may have been influenced by the conveniently

¹⁹ Cf. above, text to n. 14.

²⁰ Lacy (1993) 73 translates 'discussion'.

²¹ I hope it is clear that the above is not intended as a discussion of Democritus' views on chance and necessity.

short list in the lemma of the doxographical tradition already at an early stage, but it may equally well have arrived at the list of combined causes by combining the interpretation of various passages in Aristotle on its own and so have influenced the doxographical tradition. Or commentators and doxographers may have arrived at similar results independently.

That a commentary tradition is involved at *in GC* 127.17–22 as well at any rate follows from Simplicius' comments on Arist. *Ph.* 265b19–22, the lines paraphrased by Philoponus in this brief abstract (Philoponus' own comments on this passage from the *Physics* are no longer extant). For Simplicius at *in Ph.* 1318.22–34 too lists the triad Empedocles—Anaxagoras—Democritus. But he discusses in the first place the cause of motion. Empedocles' Love and Strife and Anaxagoras' Intellect are 'productive' as well as motive causes, but Democritus, Simplicius says, failed to refer to the 'productive cause' and only spoke of the motive cause.²²

Accordingly, Philoponus and Simplicius find themselves on either side of a no doubt traditional difference of opinion.

4. *Contact; acting and being affected*

We may begin by quoting Arist. *GC* 325a31–34 (cf. 48a Taylor, 67A7 DK; transl. Williams Arist., slightly modified):

They [sc. the atoms] move in the void (for there is a void); and their coming together produces coming-to-be, their separating passing-away; and they act and are affected where they happen to touch [sc. each other—ποιεῖν δὲ καὶ πάσχειν ἢ τυγχάνουσιν ἀπτόμενα], for they are not one here.²³ And being placed together and interlocking they generate.

²² For Aristotelian precedent that 'to move' is a wider concept than 'to produce' see *GC* 323a20 (but as a rule these terms are used interchangeably).

²³ Cf. Arist. *Ph.* 231a22–23, 'continuous are things whose extremities [or: limits] are one, touching [or: contiguous, in contact] those of which they are together' (συνεχῇ μὲν ὧν τὰ ἔσχατα ἐν, ἀπτόμενα δ' ὧν ἅμα)—a general definition which includes mathematics. Cf. *ibid.* 226b18–23, 227a10–13; see also below, n. 26, text to n. 35. This discussion of *haphê* is taken up again at *GC* 322b21–323a31 and further specified for physical bodies, because the student of physics has to take the effects of touch into account; on this complicated passage see Natali (2004) 202–214, and on *haphê* in general according to Aristotle Burnyeat (2004) 16–17.

Philoponus attempts to explain how this concept of ‘touch’ (Aristotle’s *haptomena*)²⁴ is to be understood here, in *GC* 158.26–159.3 (~ 54d Taylor, 67A7 DK *ad fin.*; transl. Williams Phlp., slightly modified):

‘touch’: i.e. by means of the void, for it is with this that they touch each other. For when Democritus²⁵ says that atoms touch each other he is not speaking of touch in the strict sense, which is what occurs when the surfaces of the things which touch fit over each other (τῶν ἐπιφανειῶν ἐφαρμοζουσῶν),²⁶ but what he calls ‘touch’ (*haphê*) is atoms being close to each other and at no great distance from each other; for they are at all events (*παντός*) kept apart by the void.

Surfaces fitting over each other according to Philoponus and others become one in the sense of being in the same place. Since according to his exegesis of the shapes of the atoms in both the *in Ph.* and the *in GC*, as we have seen in section 2 above, some atoms (of the elements water, or earth) are cubical, it is theoretically quite possible for surfaces of such cubelets to fit over each other. One cannot exclude that the wish to avoid this consequence is one of Philoponus’ reasons for positing that atoms do not touch in what he calls the strict sense. Various senses of *haphê*, ‘touch’ or ‘contact’, are discussed by Aristotle at *GC* 322b21–323a31,²⁷ but the strict sense distinguished by him is not the one posited by Philoponus in the passage just quoted.

This passage, as we have already seen above, is one of the three pieces of evidence in favour of the view that atoms can never touch because they are always kept apart by a bit of void. We should notice

²⁴ At Arist. fr. 208 ³R (~ 44a Taylor, 68A37 DK) *ap. Simplicius in Cael.* 295.12, from the *On Democritus* (cf. above, n. 6) Aristotle uses συμψάειν for ‘to touch’ when speaking of the atoms; and Democritus (verbatim) uses ψαῦσις for the *sense* of touch, *ap. Sext. M.* 7.138 (~ D22 Taylor, 68B11 DK). We do not know whether the alternative title ‘On the Touching of Circle and Sphere’ (περὶ ψαύσιος κύκλου καὶ σφαίρης) of the first treatise of the seventh tetralogy in Thrasyllus’ catalogue is original (*ap. D.L.* 9.47 ~ 40 Taylor, 68A33 & B111 DK).

²⁵ Note that Aristotle in the passage Philoponus comments on *disertis verbis* attributes this doctrine to *Leucippus* and does not mention Democritus, though a little earlier, at *GC* 325a2, he mentions them both.

²⁶ The clause ‘which is what occurs when the surfaces of the things which touch fit over each other’ is lacking in Taylor’s translation. For the idea see Philoponus’ second comment on Arist. *Ph.* 226b23 (above, n. 23), *in Ph.* 791.24–26, ‘or by ‘the extremities’ he means the surfaces, and says that they are ‘together’ in the sense that they fit over each other; for the surfaces of things touching fit over each other’ (ἢ “ἄκρα” μὲν λέγει τὰς ἐπιφανείας, “ἕμα” δὲ αὐτὰς λέγει ὑπάρχειν ἀντὶ τοῦ ἐφαρμόζειν τῶν γὰρ ἀπτομένων ἐφαρμόζουσιν αἱ ἐπιφάνειαι). See further e.g. Alex. *in Metaph.* 232.7–8, Phlp. *in Ph.* 545.25–546.7, 558.3–4, *in An.* 162.19–20, Simplicius *in Ph.* 581.16–18, etc.

²⁷ Above, n. 23.

that the immediate context in Aristotle is about atoms in a compound they have generated by coming together; clearly, the situation is what happens within a world-system, or in what may lead up to such a system. Later in the same commentary Philoponus refers back to this passage, saying, in *GC* 160.1–11 (partly at 54c Taylor and 67A7 DK *ad fin.*) that Aristotle is right in claiming that Empedocles should have posited not only *poroi* ('passages', 'ducts') but also indivisible bodies between these *poroi*. Such corpuscles, he adds, were posited by Leucippus; these do touch each other but are separated by the void, 'through which acting and being affected take place—except that Leucippus did not speak of touch in the strict sense, as we have said above'.

The passage supporting this view quoted by scholars from the *Physics* commentary elucidates Aristotle's account of the distinction between 'touching and being limited' at *Ph.* 208a11–14. Philoponus, in *Ph.* 494.18–25 (~ 54c Taylor, not in DK), states that this distinction also follows from the hypotheses of Democritus: 'for as the atoms move around in the void they are limited, but do not touch anything'. The backdrop here is clearly different from that in the passages from the *in GC* just quoted: we are not supposed to think of atoms forming a compound, but of (limited) individual particles being hurtled around in the extra-cosmic void. Philoponus' account here of 'being limited' looks a shade captious, but this is by the way.

Taken au *pied de la lettre* the exegesis stated in these passages is odd—for how could an atom in any way influence another atom by means of the totally inert void? The explanation, I suggest, is to be sought in Philoponus' literal understanding of acting and being affected according to the Atomists, that is to say of coming-to-be, passing-away, change, and growth and decay. Coming-to-be is the result of the association of atoms, passing-away of their separation, change of a difference in arrangement of atoms in a compound, or of the addition or loss²⁸ of even a single atom, decay of the loss of atoms from and growth of the addition of atoms to a compound body.²⁹ Change is a matter of difference in relative position etc., or in number, and for argument's sake one may admit that the single atom, for instance, which is added to a configuration (as 'a' may be added at the beginning

²⁸ E.g. in *GC* 23.29, 'if from 'adunaton' you take away the 'a' only, you get 'dunaton'.

²⁹ On growth according to the Atomists see Philoponus' argument against Alexander at *in GC* 23.21–30.

of ‘*dunaton*’)³⁰ does not need to touch the first of the others to bring the change about. Letters of written Greek words normally do not touch each other.

But Aristotle says that atoms when acting or being affected *do* make contact. This is why Philoponus explicitly says no more than that the atoms are not in touch in the way in which ‘surfaces that fit over each other’ (a part of the sentence which, as we have seen, is unfortunately missing at 54d Taylor) do touch each other for a certain amount of time.

His way of expressing himself here may suggest that atoms can *never* come into contact *in any way*, or never can touch each other *at all*. But the remark about the *kind* of touch that is excluded, viz. that of surfaces of bodies being ‘together’, leaves open the possibility that other forms of touch, or contact, may occur and do occur. Elsewhere Philoponus indeed talks about this less intimate form of contact. He knows that atoms can strike each other and in fact constantly do this, see for instance his explanation of Arist. *GC* 325b29–31 (‘for Leucippus there will be {two modes of}³¹ comings-to-be and dissociation, viz. through the void and through contact (*haphē*), for it is at a point of contact that each compound is divisible’) at *in GC* 163.14–17:

the other way, by means of touch, (belongs to) change. For when the atoms come into contact with one another and *strike against each other* (προσκαρούουσαι³² ἀλλήλαις—my emphasis) their position and arrangement are modified, and in this way they produce change; and they obviously touch each other through the void.

Here he no longer appeals to the surfaces fitting over each other. ‘Touching each other *through the void*’ in this passage obviously means that *nothing prevents* this contact, for the void is what offers no resistance at all: *nihil obstat*. To strike against and bump into each other indeed is to be in contact and to touch, however briefly. Also see *in An.* 167.24–26 (~ 1178 Luria):

Democritus did not say that (the atoms) move because they are continuous bodies, but because of their multitude through their rebound against each other (τῇ ἀντωθήσει τῇ πρὸς ἀλλήλα).

³⁰ To turn around the example cited above, n. 28.

³¹ δύο τρόποι ἃν εἶεν bracketed by Joachim; athetesis not accepted by Tricot.

³² For this term cf. D.L. 9.31 (~ 77a Taylor, 67A1 DK), Hipp. *Ref.* 1.12 (~ 78 Taylor, 67A10 DK), Gal. *Elem. Hipp.* 1.418.11 K. (~ 179d Taylor, 68A49 DK); Simpl. *in Cael.* 242.23–26 (~ 57 Taylor, 67A14 DK) has συγκαρούεσθαι, and is explicit both about the rebound (ἀποπάλλεσθαι) and the entanglement (περιπλέκεσθαι).

There are so (infinitely) many atoms moving about that collisions are unavoidable. The word ἀντωθήσις ('rebound, 'counter-thrust'), which does not refer to some sort of *actio in distans*, is late. For related terminology and the concept involved compare e.g. the word ἀντωσις ('recoil', 'rebound') at Arist. *PN* 480a14, and his formula τὸ ὠθοῦν ἀντωθεῖται ('what impels is itself impelled again') at *GA* 768b19.

A final point. As an explanation of what Aristotle means by atoms 'touching' each other (*haptomena*) when acting and being affected,³³ Philoponus' suggestion (again, when taken *au pied de la lettre*) that 'touching' here means always remaining at some distance from each other because separated by the void is puzzling also for another reason. At the opening of book VI of the *Physics*,³⁴ Aristotle begins by defining and distinguishing (once again) the 'continuous' (*suneches*), the 'touching' or 'contiguous' (*haptomenon*),³⁵ and 'succession' or the 'next-in-succession' (*ephexês*). Things which are *ephexês* are defined as having 'nothing of the same nature as themselves between them' (*Ph.* 231a23, ἐφεξῆς δ' ὢν μηδὲν μεταξὺ συγγενές—cf. *ibid.* book V, 227a1–8). Accordingly, the atoms between which, according to Philoponus, there is at all events something that is not of the same nature as themselves, should, one is inclined to think, have been qualified as being *ephexês*, not as *haptomena*. But in fact Philoponus cannot say they are *ephexês*, because atoms in a compound, or wherever, do not form an ordered series. So he has to invent a sub-species of *haptomenon*, which turns out to be rather different from what Aristotle means by this term.

At *Physics* Book IV ch. 6 (*ad finem*) Aristotle briefly and famously refers to a Pythagorean theory, according to which the *pneuma*, or rather the void which is inhaled from outside the heavens, enters into the cosmos and limits and distinguishes 'the natures' (in the first place numbers), as if the void were a kind of separation and distinction of the *ephexês* (*Ph.* 213b22ff. ~ 58b30 DK). This peculiar identification of *pneuma* and void looks like a conflation of Pythagoreanism and Atomism, for which there is also other evidence in Aristotle, as we shall see shortly. Philoponus *ad loc.*, in *Ph.* 616.5–8, comments on this passage by referring forward to the definition of *ephexês* in book V (i.e. 227a1ff., see above). He adds that these *ephexês* items are not continuous but separate, and that the void is the cause of their separation and distinction. Simplicius *ad loc.*,

³³ Above, text to n. 23.

³⁴ See e.g. Bostock (1991) 180–183.

³⁵ Cf. above, n. 23.

in *Ph.* 651.25ff., refers to Alexander's interpretation that not all bodies are continuous, but—citing (the Aristotelian) definition of *ephexês* and appealing to Aristotle's reference not to bodies, but to the ordered series of numbers—prefers another, i.e. Neoplatonist interpretation of these 'Pythagorean riddles' which I cannot (and need not) enter into here.

Now Aristotle himself already said that 'in a way' the Atomists too—i.e., just as the Pythagoreans—'are saying that everything there is is numbers, or evolved from numbers' (*Cael.* 303a3ff. ~ 54a Taylor, 67A15 DK). Simplicius, in *Ph.* 610.3–12, explains that the atoms resemble the monads (sc. of the Pythagoreans), for the void, separating from each other the atoms of the Atomists as well as the monads of the Pythagoreans, prevents the existence of a continuum (*ti suneches*). Aristotle says 'in a way', he adds, because, naturally, numbers differ from atoms in being incorporeal.

Accordingly, Aristotle's not always lucid exposition of the differences between 'continuous', 'contiguous' and 'successive', and his use of this terminology in various places, will in some way have contributed to Philoponus' subtle interpretation of his account of atoms in contact.

5. Conclusion

A notorious fragment preserved by Sextus Empiricus, *M.* 7.117–118 (~ D6 Taylor, 68B164 DK) has been adduced in favour of the thesis that atomic motion, or at least "some atomic motions", are to be explained by attraction³⁶ (I do not think this passage is a verbatim quotation, as Diels-Kranz and others believe;³⁷ but this hardly affects the argument).

³⁶ Taylor (1999) 193.

³⁷ Compare the sequel, *M.* 7.119, where Sextus gives a summary account of Plato's doctrine of perception and cognition of like by like in the *Timaeus*, the first part of which as to content and part of its vocabulary is close to the first part of what is attributed to 'Posidonius expounding Plato's *Timaeus*' at *M.* 7.93 (fr. 85 E.-K.); on Posidonius in relation to a large section of *M.* 7 see below, n. 39. The greater part of Sextus' account of Democritus at *M.* 7.117–118 is not much different from the parallel Aëtian lemma (ps.Plutarch only), *Plac.* 4.19.3 Diels, generally cited among the testimonia not the verbatim fragments (~ 124 Taylor, 68A28 DK). The combined quotation in Aëtius of the well-known proverb 'crow settles next to crow' and the often cited Homeric line 'the god always draws like to like' (*Od.* 17.218) is paralleled at Arist. *Rhet.* 1371b16–17, *EE* 1235a7–8, and *MM* 2.11.2.3–4.

Democritus according to Sextus pointed out that animals flock together with animals of the same kind, that different kinds of seeds are sorted out by the sieve when this is twirled, and that the motion of the surf pushes oblong pebbles into the same place as oblong and round pebbles into the same place as round, ‘as if the similarity in things had something which brings them together (συναγωγόν τι).’³⁸ This final clause was (and is) believed by some scholars to be an addition by Sextus, or rather by Posidonius who has been assumed to be Sextus’ source here.³⁹ Carl-Werner Müller however argued almost forty years ago that there is no need to detach it from the abstract, and rightly insisted on the implication of the introductory words ‘as if’ (ὡς ἄν).⁴⁰ It is not really the case that the similarity in shape brings like things to like all by itself; for a specific impulse brought about by something else, such as the regular swirl of the sieve, or the ever repeated and regular movement of the waves, is an indispensable condition. These motions of the waves and the sieve are ultimately dependent on that of the cosmic revolution, the successor of the cosmogonic vortex;⁴¹ and so, I suggest, are those of the animals of the same kind finding each other, though it is not clear what intermediary causes help to bring this about.⁴² On the other hand, the breaking-up of e.g. swarms of birds, which goes against the motion of like to like, also needs to be explained.

³⁸ Taylor (1999) 5 translates ‘a kind of attractive force’.

³⁹ For this discussion see Müller (1965) 77f., Morel (1996) 409–411. For Posidonius as source of the whole section Sext. *M.* 7.89–140 see Kidd (1988) 340–343, *contra*, and Sedley (1992) 27–34, strongly in favour. Baltes (1978) argues that Posidonius here depends on the Early Academy.

⁴⁰ Müller (1965) 77f. A similar conclusion is reached along a different route by Salem (2002) 265–267.

⁴¹ For the revolution of the heavens as the successor of the vortex see e.g. Perilli (1996) 92–95. It is, I suggest, also ultimately responsible for the behaviour of the loadstone and the iron described [Alex.] *Qu.* 72.28ff. (~ 160 Taylor, 68A165).

⁴² In the ‘like to like’ *topos* lists of animal species are traditional, see Müller (1965) 152f. with n. 6. Morel (1996) 413f. hypothesizes that in 68A28 and B164 DK the souls of the animals are involved: like knows like. But this does not yet explain why like moves towards or stays with like. The alternative explanation of these references to animals, grains, and pebbles, viz. that truths about the behaviour of the atoms are made clear by examples from our daily experience, need not be ruled out and may indeed be subsidiary. According to a certain Diotimus cited by Sextus, *M.* 7.140 (~ 179a Taylor, 59B21a & 68A111 DK), Democritus praised Anaxagoras highly for his thesis that the phenomena can be instrumental in revealing what is hidden. In the Aëtian passage (above, n. 36) the idea that sound consists of bodies of air of the same shape moving about together with corpuscles which come from the voice certainly pertains to what is hidden.

The analogy is obvious: think of the end of a cosmic system, or of an individual inner-cosmic compound.⁴³

I conclude that a partial selection of passages from Philoponus' commentaries is insufficient evidence in favour of the assumption that according to Democritus the atoms never touch each other at all. The testimonia conveniently printed in our fragment collections or otherwise available should not be put on the same level, "auf einer Fläche", as Wilamowitz used to say, as if they had the same quality and were equally reliable.

In the present case, all we have to assume is that the early Atomists, perhaps naively, believed that the very small atoms are so hard that, when colliding and briefly striking each other with great force, they cannot fuse at the split second of physical contact because of this density and solidity and because of the great velocity of their movements. And of course even then they are in touch only partially, for as to the greater part of their circumference when making contact they are still surrounded by void.

⁴³ Cf. above, n. 6, and Hipp. *Ref.* 1.13 (~ 78 Taylor, 68A40 DK), Aët. 2.4.9 Diels (~ 82 Taylor, 68A84 DK).

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